THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVII. No. 1973.] LONDON, MARCH 5, 1901. [53RD YEAR. PRICE 6d.

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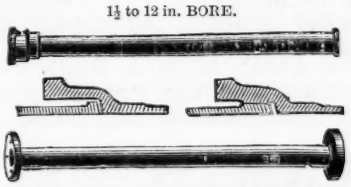

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A couple of months ago when coal, which formerly cost us 8s. per ton rose to 12s. 6d., we read a lecture on the cost of steam production by John Holliday, in which the following paragraph appeared:—

Mr. Bryan Donkin, M.Inst.C.E., has published figures from some tests he carried out with different kinds of fuel in the same boiler, the conditions in all cases being the same; the results are comparable on the basis of the cost of fuel required to evaporate 1000 gallons.

Kind of Fuel.	Cost of Fuel per Ton.	Water Evaporated per Pound of Fuel.	Cost of Fuel per 1000 Gallons Evaporated.
	s. d.	lbs.	s. d.
A. Dust Coke	5 0	6	3 8
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Average week, Coal only, on One Boiler.

	£ s. d.
45 Tons at 12s. 6d.	28 2 6
Ashes at 2s., Seven Loads	14 0
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Six Tons of Coal at 9s. 3d.	2 15 6
Coke Dust	3 4 0
Two extra Stokers	2 12 0
Flues cleaning	10 0
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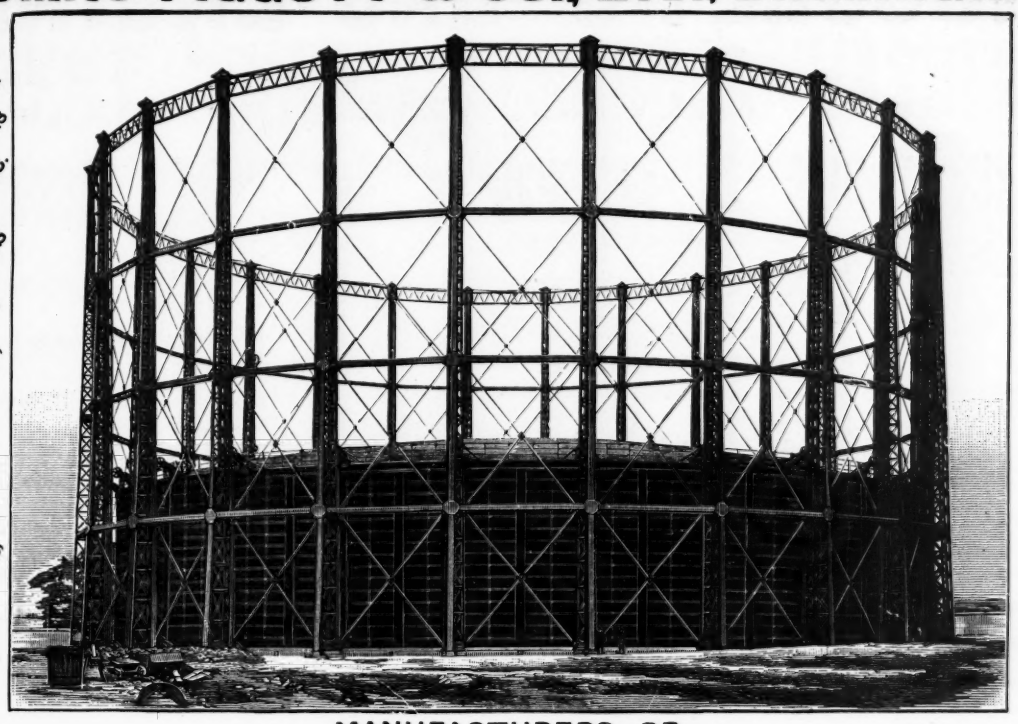

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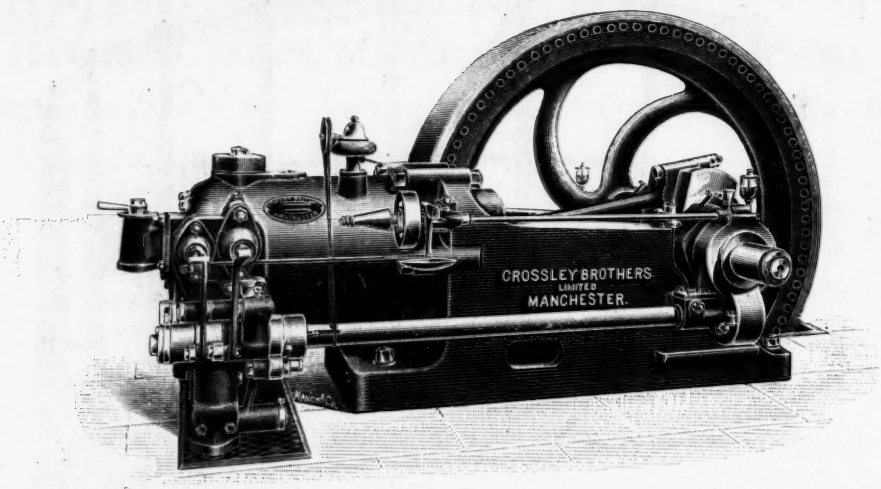

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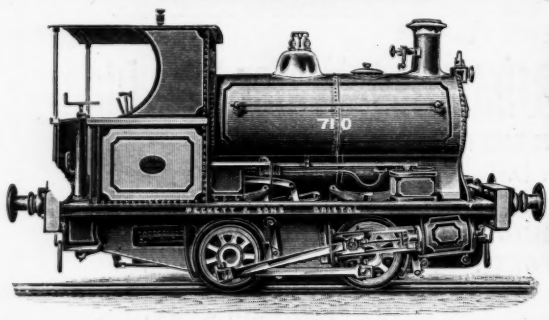

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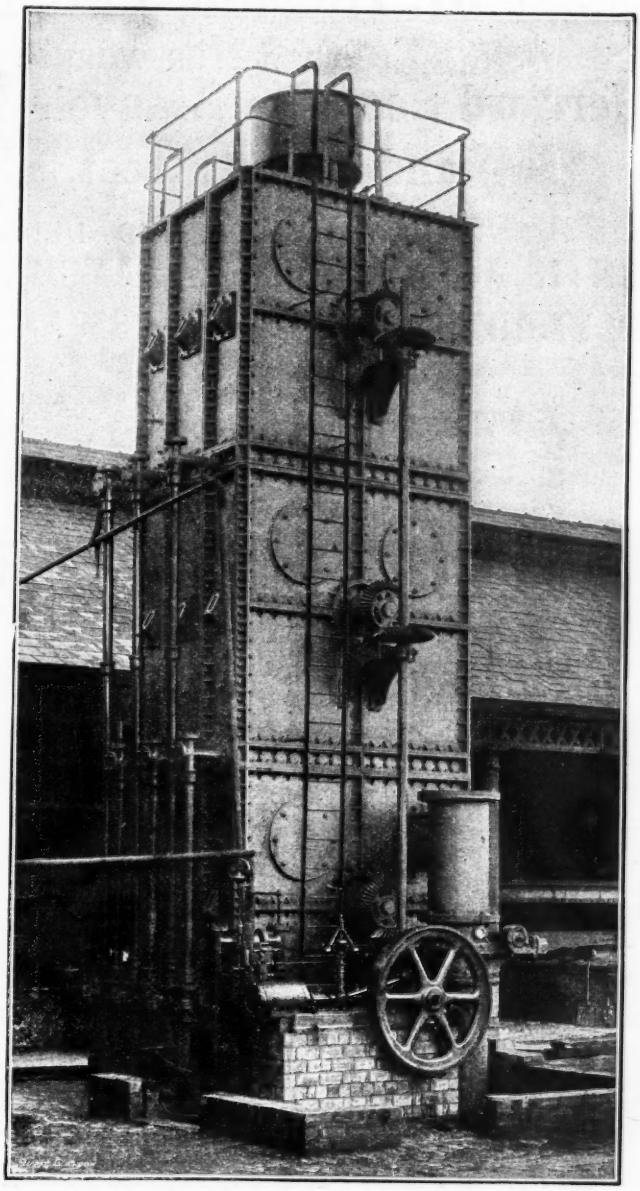

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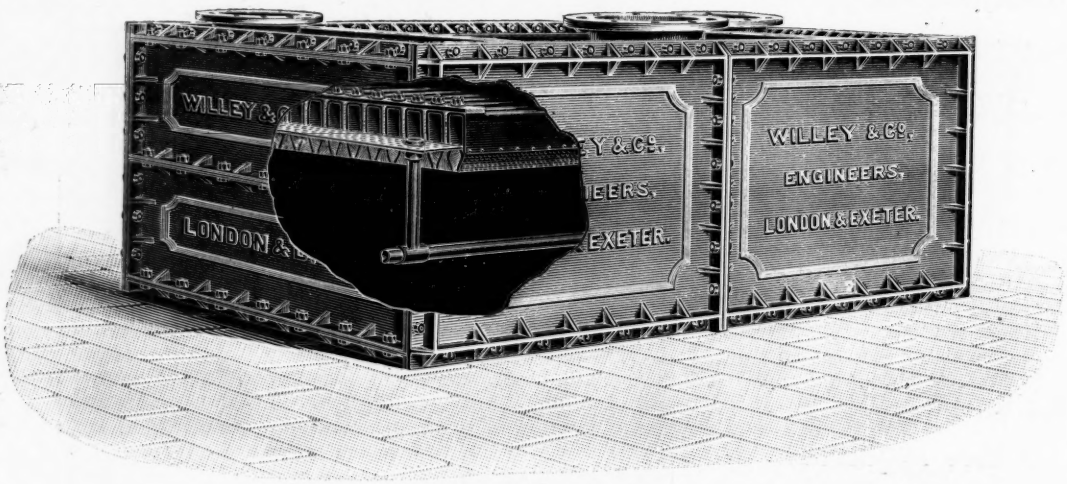

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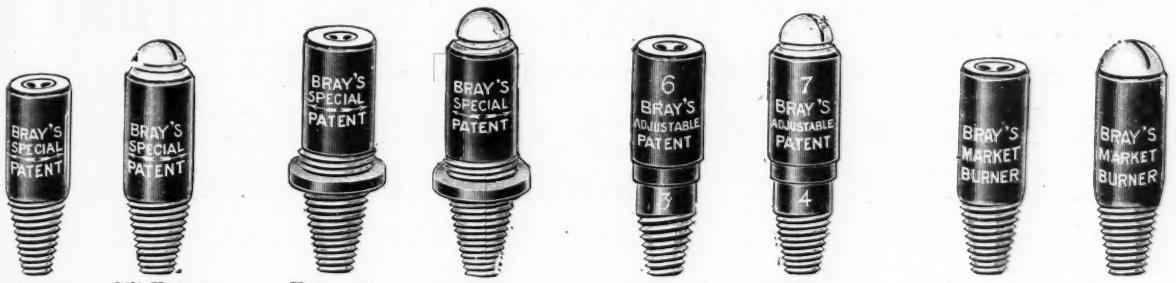

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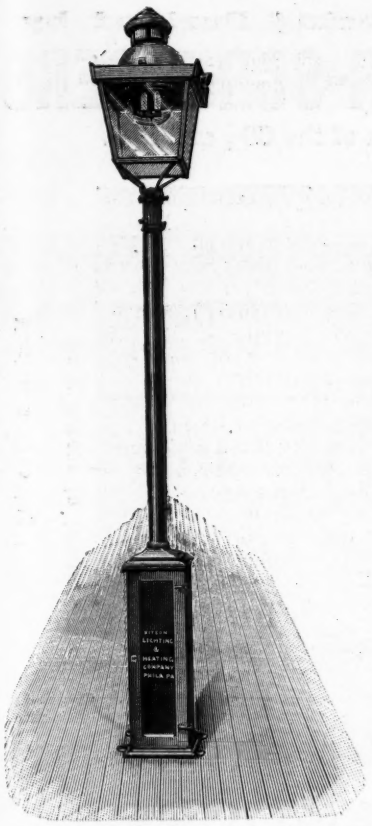

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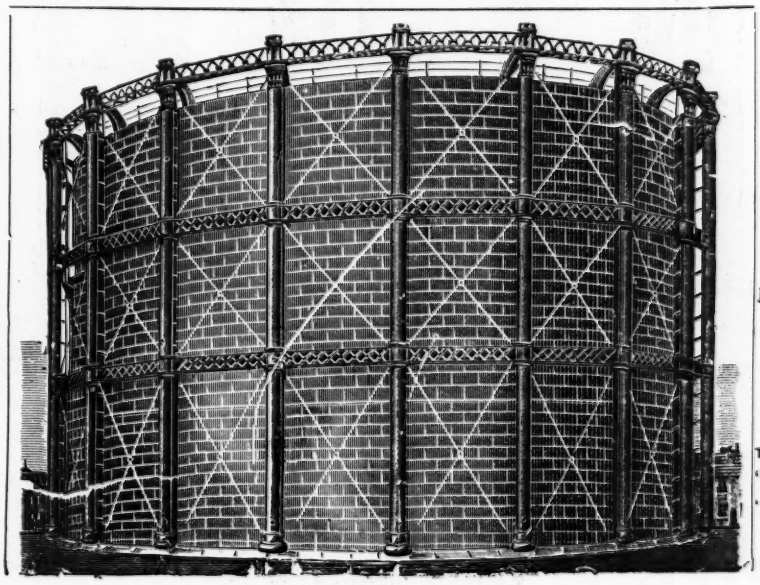

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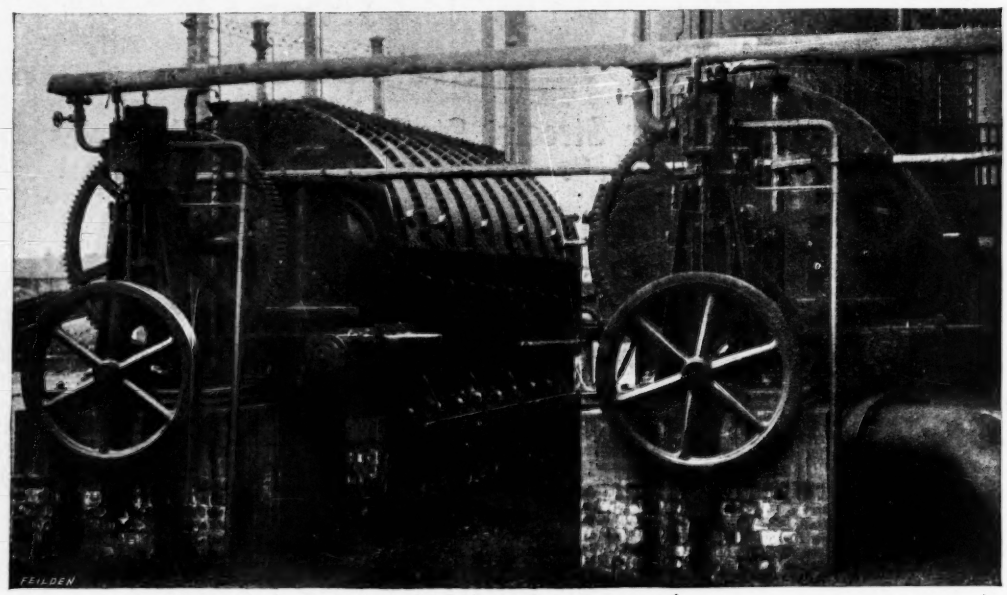

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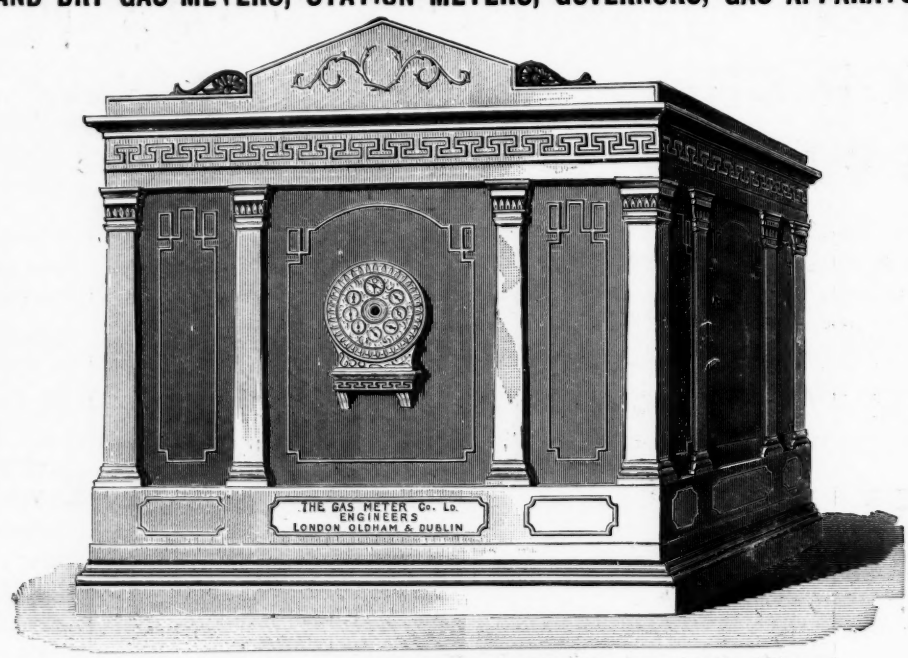

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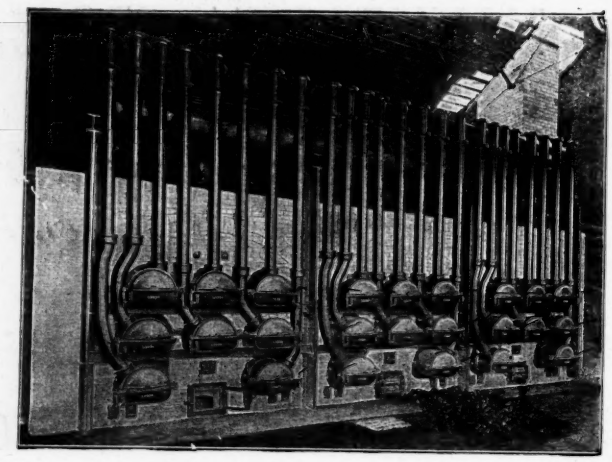

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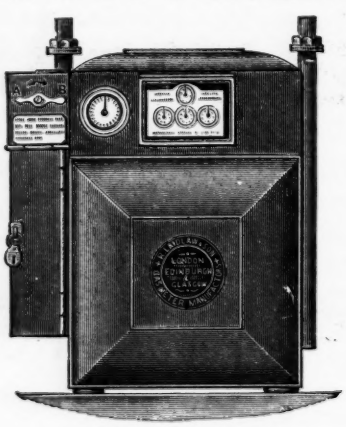

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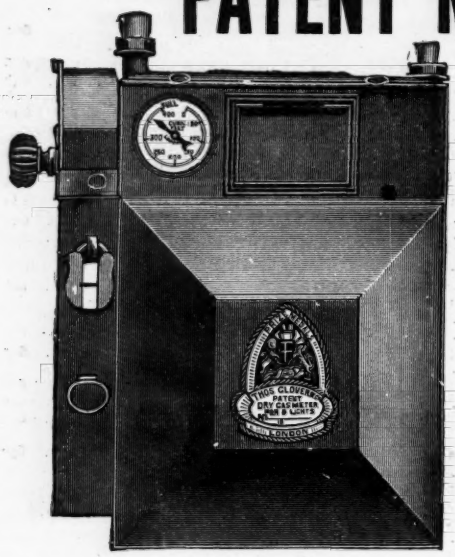

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVII., No. 1973.—TUESDAY, MARCH 5, 1901.

EDITORIAL NOTES.

The Mines (Eight Hours) Bill.

THE Mines (Eight Hours) Bill was read a second time, as a Private Members' Bill, in the House of Commons on Wednesday last, by a mixed majority of 13, in a House of 411 members. This is undoubtedly a considerable triumph for the friends of the measure, who are a heterogeneous crowd, as may be perceived by the fact that the names of Mr. Keir Hardie and Sir Albert Rollit follow one another on the back of the Bill. The same measure had, in effect, already survived a second reading in the Lower House, during a Liberal Administration; and much jubilation has arisen over the circumstance of its now having been accepted in principle by a Parliament of a strongly Conservative cast. There is not very much in this, perhaps; the lines of Party division being now independent of strict economic principles—if, indeed, any such principles remain distinguishable in the domain of practical politics. In so far as the Bill in question is a Socialist and Trade Unionist scheme, it would naturally command the support of the Radicals. If it is to be regarded as an extension of the Factories Acts, the Conservatives could equally accept it. Never was a project of legislation of so questionable a character, and so far-reaching a scope, couched in so few words. It has one executive clause, which runs as follows: "A person shall "not, in any one day of 24 hours, be employed underground "in any mine for a period exceeding eight hours from the "time of his leaving the surface of the ground to the time of "his ascent thereto," except in cases of accident. Infractions of the law are to be punishable by fines, as under the Acts relating to factories and workshops. This beautifully simple and short project involves several alterations of the law of the greatest magnitude. In the first place, it limits the natural right of adult men to dispose of their time to what they may individually consider to be the best advantage. This may be a small matter; but it is as well to recognize the truth.

Who wants this statutory limitation of the hours of adult labour in mines, and why do they want it? Originally, without doubt, the measure was fathered by Trade Union leaders connected with the Miners' Federation, with the avowed object of restricting the output of coal mines, in order that the price of coal might be raised against the public, and the men employed in getting it be enabled to share in the plunder of the consumers. It argues a considerable amount of assurance on the part of these would-be legislators to crudely ask Parliament to play into their hands in this way. So long as they did so, their cause made little progress. After awhile, however, it occurred to the promoters of the scheme to bolster it up on other grounds. Consequently, it was advocated as a means of making employment for large numbers of men who at the time were popularly believed to be walking about doing nothing, just because there was no work for them. The British Public has its fits of interest in passing fancies; and some ten years ago the question of the "Unemployed" was in everybody's mouth. But the attempt to hitch on this Bill to the problem of how to find work for everybody by Act of Parliament, failed. The craze passed; and the eight-hour miners fell back upon a plea which never fails to enlist the sympathetic attention of the amateur of domestic legislation—the claim that the Bill would increase the safety of underground workers. If they had come to Parliament with clean hands, relying upon the philanthropic argument, there is no saying what might have happened. For whether such an enactment would or would not render coal mining safer all round, it would certainly benefit the lads employed underground, who admittedly work for ten hours at a stretch. This is the real strength of the case for the Bill, and was undoubtedly the reason for its second reading last week.

Although in its origin suspect, and in its early days promoted with the narrowest of selfish motives, the Bill has lived into something like the good repute of a Factory Act. The opposition of the coalowners in the House did not carry weight. The House and the country are no more to be frightened at the dismal forebodings of coalowning magnates who assert that the Bill would restrict the output of coal by many millions of tons yearly, and increase the cost of getting it by 2s. or 3s. per ton. The price of coal went up last year very much more than this, for no particular reason at all. The coalowners are discredited, besides, by their mistaken estimates of the cost of the Workmen's Compensation Act. There is something very puzzling to the ordinary man, moreover, in the opposition to an eight-hour law of employers who with the same breath complain that their men will only work 42 hours a week. If the Trade Union and Socialist supporters of the Bill are suspect, can it be said truly that the opponents—whether coalowners of the Federation districts or miners of Northumberland and Durham—are better entitled to respect? The great majority of the population of this country, who are consumers of coal, do not repose implicit confidence in any party connected with the industry. They certainly have little patience with those aristocrats of the pit, the hewers, if it is true, as alleged, that, while only working for 6½ hours themselves, for about four days a week, they object to any legislative relief for the lads of thirteen years of age whom the system compels to work for ten hours a day, and even longer. Only let the British public once get possessed of the conviction that this is the reality of underground work in mines, and legislation to cure it will certainly come. If those who oppose the Mines (Eight Hours) Bill are sincere and not selfish, they will formulate some suitable expedient for dealing in a better way with the hard case of the pit-lads.

Manchester Institution Meeting.

THE Manchester District Institution of Gas Engineers have during the past few years been very fortunate in their Presidents and in the quality of the addresses from the chair. The one which Mr. Charles Wood delivered on Saturday last left no break in the record. From almost the beginning to the end, it was a string of personal experiences and facts, treated and presented in a chatty vein which held the members' attention throughout. Some of the topics were rightly regarded as worthy of "special mention" at the close of the address; and these and others would have supplied sufficient controversial matter, if presidential utterances were not regarded as inviolable, for keeping alive a current of debate at two or three meetings.

Almost the first words the President uttered had for their purpose the adding of an entreaty to the many that have been offered during the past twelve months and more for unity in the gas profession. Then the President passed on to speak of Company and Corporation administration of gas affairs; and he very cleverly steered a straight course between the shoals which beset the voyager who sails this contentious sea. But this brought him to the Bradford Corporation Gas Affairs; and he made public some figures which are of supreme interest in the absence of the undertaking from "Field's Analysis." The management having passed from father to son, the son might have been pardoned for making a point of his pride at the position it occupies in the scale of capital expenditure; but he modestly confined himself to the statement that "our capital is only 5s. 3·42d. "per 1000 cubic feet of gas made." Many an engineer of a municipal undertaking, and company undertaking too, for the matter of that, will look with envious eyes on this figure. This low capital is reflected in the low net prices charged for gas during the past thirteen years—ranging from 1s. 11⅝d. to 2s. 3d., until the rise of 3d. last July. Here an interesting problem presents itself. Supposing that the consumers of gas had not to shoulder the burden of about 98 per cent. of the public lighting, and supposing that they did not have to contribute something like £35,000 per annum towards the expenses of other municipal departments, at what price would Mr. Wood be able to supply his consumers? Given a return to old coal prices, even Widnes would have to look out. It is good to see the way Mr. Wood shows his feeling on the matter of the depredations on his "claim;" and he points to the unfairness in as plain a manner as necessity requires. Unrighteous as have been these heavy demands on the gas consumers in the past, the unfair fostering of the electric light in the borough makes the injustice the more

pronounced. The effect of the competition is presented by the President's figures and remarks, none of which require definite mention here to point their significance. The peculiar system which obtains in Bradford of making the property owners responsible for the gas consumed in small houses, is noteworthy; but we venture to think an indignant howl would rise if the Municipality of any other town tried to introduce such a system now. It is only an example of what curious institutions one can become accustomed to. A passing reference to the presence of arsenic in coke subsequently produced the intelligence that this is a more serious matter from the selling point of view in some districts than had been imagined; and we hope that Mr. H. Townsend's plea for defence will not be allowed to fall.

An unassuming little paper by Mr. Richard Hooton, of Ashton-under-Lyne, on the question of enrichment, drew out an excellent discussion. After twelve years' service as Honorary Secretary, Mr. S. S. Mellor retired at this meeting. To his devotion and energy, much of the success and strength of the Institution are due; and the members were well advised to secure his aid in the work of the Committee during the next three years.

A Gigantic Amalgamation.

The success of negotiations inaugurated by Mr. Pierpont Morgan for the consolidation of practically all the steel-works in the United States into one gigantic "trust," has not unnaturally arrested the attention of most of us, and has led to the inevitable question in the House of Commons by that ardent Protectionist, Sir Howard Vincent. The operations of this huge undertaking, with a capital of something over 200 millions sterling, will be watched with great interest by the people of this country, and with considerable apprehension by English steel makers. So far as the general body of consumers on this side of the Atlantic is concerned, the effect of the formation of the Steel Trust will undoubtedly be favourable rather than otherwise. The organizers of the Trust are reported to have calculated that the cost of production will be reduced about ten shillings per ton of steel, through the economies rendered possible by working upon a vaster scale. As the Trust will now control about 40 per cent. of the total steel output of the world, and preparations are being made for the development of the steel-export business of the States, it needs little demonstration for the fact to become obvious that prices in this country must be very considerably affected by the course of events in America. Coal, iron, and steel will have to be cheap in the near future if our manufacturers are to hold their own.

Apart from the question of the influence of the Steel Trust on prices, no little interest attaches to its formation. What everyone wants to know is, Can such a gigantic conglomeration of various undertakings be welded into a homogeneous and economically managed whole? Amalgamation has not always been found financially successful—size is not by any means a guarantee of efficiency. Indeed, a big concern mis-handled does all the more harm, and comes the more hopelessly to grief, by reason of its magnitude. It is decidedly interesting to note that the organizers of the Steel Trust believe in paying princely salaries to the chief servants. Report speaks of £160,000 per annum for the Head Manager, Mr. Charles M. Schwab—the man who was chosen to run the Carnegie concern when he was but thirty years of age. Even if we read "dollars" for "pounds," we should have a salary of about £3000 a month. What a scream of indignation there would be if the London Gas Companies were to put their management into the hands of one man, and give him that salary! Yet, if the right man could be found, he would be worth the money.

Another question of great interest raised by Mr. Morgan's operations is this: How long will the American nation endure the process of being exploited for the benefit of the Steel Trust? The present tariff on steel imports gives the Trust a practical monopoly of the home markets; and nothing could have happened better calculated to convert the majority of the Americans to Free Trade than the formation of this great combination, which so obviously requires no protection. It would not be a source of surprise to us to find that the remarkable industrial expansion of both Germany and the United States eventually led to the adoption of Free Trade by those nations. The agitation has already commenced in both countries, but must of necessity require years for its accomplishment. This certainly is not, as some people seem to imagine, the time when we should depart from our system of unrestricted trade.

An Injudicious Circular.

Attention is drawn, by a letter we publish to-day, to what appears to be a new line of action now being taken by the Executive of the Working Men's Lord's Day Rest Association, in circularizing gas-works foremen directly, with the object of inciting them to get up petitions by the working hands for the reduction of Sunday labour. These circulars bear the signature, "by order," of Mr. Charles Hill, Secretary of the Association. They state that the Committee of the Association "has been asked"—but by whom is not disclosed—to move the gas workers thus approached to petition their directors and managers "in a friendly manner" to slack off Sunday work as much as possible. In order to facilitate this action upon the part of the men, a Form of Petition is enclosed with the circular; and, in case they should be ignorant of the subject, a copy of a kind of tract-pamphlet called "The Pearl of Days" is also supplied. It does not take much reasoning to show that this is a false step on the part of the Association. As an underhand attempt to raise an agitation among gas workers, it is dead against discipline, and is likely to do far more harm than good. Surely, the well-meaning persons who committed themselves to this secret form of propaganda cannot have realized that they were repeating the Jesuitical operation of "doing evil that good might come." So prone are busybodies to think that their own proceedings must be justifiable so long as the intention is good! It is difficult to reason seriously with people of this character; but perhaps if they could be brought to see that straightforwardness is the best policy, they might cease acting surreptitiously.

Have the Working Men's Lord's Day Rest Association tried the employers first? Because we would not say, on general principles, that in no circumstances would a direct appeal to gas workers be permissible. The sacred right of insurrection is in the last resource the safeguard of our liberties; but it is not to be lightly invoked on that account. And we declare emphatically that this cause of the reduction of Sunday labour in gas-works is not one to be advanced by the way of stirring up mutiny. To go directly to a works foreman, and ask him to make himself responsible for getting up a petition signed by the men under him for presentation to the management and the directors of a gas undertaking, is a downright outrage upon public policy which none but a fanatic would tolerate. The worthy men who have been attacked in this way are deserving of much sympathy. Many of them, doubtless, are in full agreement with the burden of the petition, and therefore hardly know what is their duty in the emergency thus gratuitously thrust upon them. Most of them will probably remember in time that their office is that of an intermediary between the management and the working staff. It is their duty to receive orders from one quarter only, and to see them obeyed. Their place is incompatible with the distribution of tracts, or carrying on an insurance agency, or betting with the men under them.

As to the outrageous conduct of the Executive of this Association, it is difficult to comment upon it with proper restraint. After all, it is only a labour-saving dodge of theirs. They will not set to work in a proper missionary spirit, but want to remain comfortably at home at ease, and set somebody else to do their self-appointed task, gratis. They would much like to be able to advertise the number of petitions to gas managers they have been "instrumental" in originating. Why do not the paid officials of the organization do their own work? Let them find out, through their Vice-Presidents—numerous enough—what gas companies and corporation gas departments are backward in this matter of reducing Sunday labour, and approach them. The Sunday rest, let them remember, was always a gift to the labouring man from above. He cannot win it for himself. If he were strong enough to extort it at will, he would sell it, as the Trade Unions do, for double pay. Even then, he would attend to all sorts of things first. Hence the underground action of Mr. Hill's Association is as misdirected as it is mischievous.

The Seamy Side of Municipal Trading.

It is like a breath of fresh air through a crowded political meeting to listen to the quiet protests of Lord Avebury, Lady Jeune, and Miss Octavia Hill against the swelling craze for Municipalism. Lord Avebury's recent address as President of the Royal Statistical Society was chiefly devoted to an exposure of the fallacies by which the principle of municipal trading is commonly supported. His Lordship

does not believe that Municipalism usually pays, when everything is properly reckoned; and he lays great stress on the too-often overlooked consideration that where Municipalism is, the guarantee of efficient service is weakened. Lady Jeune and Miss Hill recall public attention, at a good time, to the extraordinary assumptions involved in the latter-day pretension that the great "Housing of the Poor" question is one for local authorities to deal with. Ten years ago nobody cared for this subject; nowadays all the Progressive municipalizers want to have the monopoly of it. Does anybody, asks Miss Hill, realize what this demand means? Is it the idea that Municipalities or County Councils should house the entire working population, or only a proportion of them? If the former, what of the numbers to be dealt with, and the cost of the process? Do our ardent municipalizers, who appear ready off-hand to appropriate the re-housing of the labouring population as work for local authorities, think such a body capable of doing the business? "Do they think the supervising body should be "the judge of its own shortcomings? Do they think the "conduct of huge business undertakings will tend to keep "a public body clear from jobbery and corruption?"

There's the rub; and it occurs in every development of municipal trading. As time goes on, it appears more clearly that those who resist the unnecessary extension of municipal trading enterprise, in the public interest, will be well advised to drop detail criticisms and rely upon the fundamental objections to this class of adventures plainly stated by Lord Avebury, Miss Hill, and Lady Jeune. The suspicion of jobbery is never wholly removed from local authorities engaged in financial and industrial operations. This is not to say that here or there is corruption; but "where the carcase is——." During the last few months, in all parts of the country, much uneasiness has been caused by certain incidents of municipal government which need not be more definitely mentioned; and it is safe to say that what came to the surface was but a sign of the unseen condition of the depths. Lady Jeune also speaks of the "caprice" of municipal bodies, who regard their business "from every point of view except "the real one, and who are, if honest, so incompetent that "they earn their experience by experiment and failure." This is, at any rate, one side of the general question of trading by municipalities, the opposite aspect of which has been lauded to the point of nauseation by a sycophantic Press and by self-seeking professional men.

The Lamp-Posts on the Thames Embankment.

Those who are laudably jealous for the preservation of whatever is really handsome in London, will learn with a feeling of relief that the electric arc lighting of the Victoria Embankment by the London County Council has not actually spoilt the appearance of that magnificent promenade. This is a distinct gain; for the treatment of Waterloo Bridge by the County Council was such as to awaken the keenest apprehension in respect to the fate of the Embankment at the same hands. It is a difficult problem to make electric arc lamps anything but hideous; and the usual practice of the designers of standards for these lights has heightened their ugliness rather than otherwise. Let it be counted to the County Council for righteousness, therefore, that for the parapet lighting of the Embankment they have had the grace to retain the old gas lamp-posts, merely dropping the new electric lamps into the existing globular lanterns, which scarcely alters their general appearance. As an electrical contemporary puts it: "It was at first feared "that the old gas-lanterns would have to be removed." Naturally. Wherever there happens to be a particularly successful bit of street decoration in London, the chances are that it has to be cleared away in order to make room for something else. In this case, however, the contractors for the new lamps themselves suggested modifications which enabled the beautiful and familiar parapet lamp-columns to be retained. Nobody would have cared a jot if they had all been reduced to scrap iron, and brand-new posts of the most degraded design put in their place. But this outrage has happily been spared, though quite by accident, as it appears. Londoners must be thankful for small mercies of this kind. With their County Council dying to run tramcars along the Embankment, over the bridges, and through the historic thoroughfares of Westminster, puny amenities like public lamp-posts with character and grace of form stand a poor chance of winning regard. As for the new system of lighting, judged as lighting, it is "naught," in Touchstone's phrase. What can be expected of 6-ampere lamps? Of course, the newspapers credit them with 1000-candle power, while the kerb lamps—central lighting was mercifully rejected—are supposed to be of 2000-candle power. They are the ordinary 12-ampere lamps. It seems to us very petty for the County Council to give any countenance to this hoary old piece of deception. The current for the Embankment lighting is specially generated by gas power; and the Architect of the Council (Mr. W. S. Riley) is to be complimented upon the successful station building which he has erected close to the Charing Cross District Railway Station.

The Internationalism of Capital.

There has been brave talk for many years about various forms of Internationalism, which has not prevented occasional outbreaks of animosity between different nations. Still, notwithstanding the rebuffs that have been experienced from time to time by those perfervid apostles of peace who have endeavoured to precipitate the Millennium, only to discover that people can still find enough to fight about, it cannot be denied that the substantial agreement of the principal nations to stick to business has solidified. Year by year the rulers of international commerce speak and act more independently of national boundaries. London advances cash to Berlin, or receives it from Paris, and employs it in America, with ever-diminishing fear lest the course of trade may be again interrupted by national hostilities. A striking illustration of the operation of this real League of Peace, as distinguished from the formal compacts that diplomatists talk about, is afforded by some observations of the Chairman of the Merchants Trust, Limited—an investment Company with twelve years' experience and a million of capital. The Directors of the Company employ their funds wherever they think fit—the only question for them is to choose the best investments. The Chairman told the shareholders, at the recent general meeting, that he is not at all inclined to put money into British coal or iron just now, especially in view of the great American Steel Combination. He sees nothing better than United States properties, and is partly moved to this opinion by reason of the superior productiveness of American workmen. The American produces more because he is better provided with labour-saving machinery, and also because he works longer and harder than the average British workman. "In these circum-"stances, would they rather hold for investment Pennsyl-"vania Railroad shares, or North-Western Railway stock?" It is startling to find such a question following such a statement. If, however, this reminder of the truth that the only source of wealth is productive labour could be brought home to the muddled brains of our Socialist Trade Unionists who believe the opposite doctrine, that the less work a man does the better for himself and everybody else, it might effect some good.

Coal and Iron in Belgium.—The production of coal in Belgium in the second half of last year was 11,612,292 tons. The output for the first half having been 11,740,060 tons, the production for the twelve months was 23,352,352 tons. The corresponding output for 1899 being 22,072,068 tons, the production increased last year to the extent of 1,280,284 tons. The aggregate production of iron of all kinds was 362,252 tons, as compared with 475,198 tons in 1899. The production of cast steel (ingots, &c.) in the second half of the year was 292,057 tons. The output for the first half of the year having been 362,770 tons, the production of the year amounted to 654,827 tons, as compared with 731,249 tons in 1899. Forged steel (rails, plates, &c.) was made in Belgium in the first half of last year to the extent of 256,206 tons, while the output for the first half of the year was 307,850 tons; making a total of 564,056 tons, as compared with 633,950 tons in 1899. It will thus be seen that while the production of coal increased, that of iron and steel experienced considerable contraction last year.

The Illuminating Power of Electric Arc Lamps.—It is stated that the firm of Ganz and Co. are bringing out a new pattern arc lamp for use on alternating circuits, from which good results are said to have been obtained. This lamp has more the general appearance of a Wenham gas-lamp than that of the usual type of arc lanterns, which is rather an advantage. It has a pair of carbons which meet at the bottom of the lamp at right angles, each carbon being inclined at an angle of 45° with the vertical. Thus the light is shadowless, and the distribution as perfect as possible. There is, of course, nothing novel in this, many of the now defunct arc lamps of early makers showing the same arrangement of the carbons. In the "Hackl" lamp, the illuminating power is stated to be developed at the rate of 0·52 watt per candle power; whereas the makers rate an ordinary arc lamp with glass globe at 1·56 watts per candle power. Thus do one set of electricians expose the false pretences of another. Instead of the ordinary arc lamps supplied by the direct current giving a light of 2000 candles according to the hoary old British imposture, this rating gives them an illuminating power of 320 candles.

WATER AFFAIRS.

Withdrawal of the Proposed New Water Regulations.

As a concession to the clamour raised against their proposed new regulations, the Metropolitan Water Companies have deemed it advisable to ask the Local Government Board not to proceed with the inquiry they instituted with regard to them. It will doubtless be remembered that the proceedings in this matter were adjourned on the 20th ult. to allow of a conference of the Engineers of the Companies; and when they were resumed last Thursday, the senior Counsel (Mr. Cripps, K.C., M.P.) announced the decision come to. As will be seen by the report which appears elsewhere, he briefly set forth the circumstances under which the revised regulations had been brought forward, and concluded by expressing, on behalf of the Companies, the opinion that the opposition which their proposals had aroused was attributable to a large extent to a misapprehension of the objects sought to be obtained. The Official Water Examiner and his two colleagues have consequently been saved a long and tedious inquiry; for Mr. Freeman, representing the London County Council, confessed that he had a formidable array of about fifty witnesses—comprising engineers, medical officers, and other persons, not only from the Metropolis, but from other great cities—who were to be called to condemn the regulations. Holding, as he did, a brief for the Council, he was fully justified in making their case as strong as possible; but he was scarcely entitled, we think, to charge the Water Companies with causing the inquiry under an entire misconception of their rights and duties, and making their alleged misconduct in this regard a pretext for asking that they should be made to pay the "reasonable costs" which the Council had incurred in the public interest. In this application he was naturally supported by Lord Robert Cecil, on behalf of the City and the county of Middlesex, as well as by the representatives of the opposing bodies. Mr. Perrin, of course, promised to bring the point under the notice of the Local Government Board; but, judging from the reply given by the President to the question put on the subject by Dr. Macnamara in the House of Commons the next day, the Department have no power to allow costs under such circumstances, and would not grant them if they had. A very different opinion on the Companies' "rights and duties" is entertained at Whitehall from that held in Spring Gardens.

The new regulations having been withdrawn, we are thrown back upon those framed in 1872, which the County Council believe—presumably from their intimate acquaintance with the water-supply arrangements of the Metropolis—have worked perfectly satisfactorily in the past. Notwithstanding the changed conditions under which consumers obtain their water now as compared with thirty years ago—the constant service being practically universal—no alteration is considered necessary in the fittings by the sapient body whose majority has during the past three years been continually boasting of their "progress." The last Royal Commission, however, knew better; and, as we pointed out only last week, the Water Companies were merely acting in obedience to the intimation given by that body in their report in submitting the revised regulations for the approval of the Local Government Board. We do not say they were not open to amendment—in fact, this was readily admitted by their framers; but we deny most emphatically that they justified the general condemnation they received. It is, moreover, to be regretted that they had to be publicly examined and criticized at a time when the Metropolis was in the throes of an election for a new County Council, because the violent and unreasonable opposition they encountered on all sides was freely made use of to further the ends of both the Conservative and the Progressive candidates. It is useless now to speculate upon the circumstances that led to this unfortunate coincidence, which was possibly purely accidental; but it is only too clear that its effect has been to estrange many who were at one time favourably disposed towards the Companies. This is evidenced by Saturday's returns, which show a large Progressive gain.

The Press has joined in the all-round condemnation of the conduct of the Companies; even "The Times"—fair and reasonable as the leading journal has always been—saying "they have an unfortunate way of going to work, even when "the work is good." In the revision of their regulations, and making them more like those in force in large provincial towns, they were really only taking the initial step in the direction of checking the great waste which now goes on, and endeavouring to ensure an adequate supply of water to the poorer classes of consumers under all conditions. If the provision of cisterns were a thing unknown in large communities, there might have been some justification, even in the face of the terms of the report of the Llandaff Commission, for raising an objection to it; but, as is acknowledged by those who have studied the subject, this is not so, such receptacles being compulsory in Liverpool, Edinburgh, and Glasgow. The Council's advisers must have been well aware of this; but it was not policy on their part to admit it. Their tactics were to stir up agitation against the Companies, in order to influence the voting at the election; and in this they were abundantly successful. If they had been the suppliers of water, and had framed the new regulations—and people who have had business with their Building Act Committee know that they can make some very stringent bye-laws when they please—they would in all probability have contended that they were absolutely necessary, and would have insisted upon them being observed. As "The "Times" says, the net result of this "woefully mismanaged" business is that London will have to put up with water regulations which have long since been superseded in large towns, and water will continue to be wasted at the rate of 60 million gallons a day in order to please the jerry-builder and the owner of a cheap house property. The "old order" has not been changed, except, unfortunately, in a direction adverse to the Companies.

Water Famine in New York.

When addressing, last Thursday, a public meeting in support of the re-election of two Progressive members of the late County Council, Lord Rosebery, as might have been expected, entertained his audience with a few remarks upon the Water Question. A good deal of what his Lordship said on this matter was mere claptrap; but it served its purpose. It helped to secure the return of the two candidates. He told his audience that, if we have a water famine this year or next, the responsibility would not be with the Council as a body, but solely with the Moderate party and the policy they were presenting; and he went on to express surprise that the Government have the nerve-force to remain under the heavy liability of a possible water famine, which could only be attributed to their inaction. His Lordship did not show how the disaster alluded to would be averted by the water undertakings being in the hands of the County Council; but he might, if he had thought fit, have given an example of a famine in existence at the present time, not due to "frost, unusual drought, or other unavoid-"able accident," or even to "necessary repairs," in a city in which the supply is in the hands of the Municipality. This state of things has prevailed for some weeks in New York and the neighbourhood; and we learn from a telegram despatched to one of our daily contemporaries on the very day on which Lord Rosebery was belauding municipal management of water supply, that in the borough of the Bronx water is now almost unobtainable on week-days, and the people are compelled to wait until Sundays, when the factories are closed and the available supply is increased, before they can procure water for ordinary domestic purposes. Even then it is only by filling baths, tubs, and barrels that they are able to store enough to tide them over the week. A curious feature of this famine is that while the poor have to go short, the breweries have water in abundance. One may well ask: Why should there be this scarcity of water in such a city as New York? One reason is the enormous waste which goes on. It has been computed that out of 115 gallons per inhabitant supplied daily, not more than 40 gallons are used; the rest running away through defective taps, of which there are something like 18,000 in the city, and badly jointed mains. Evidently, some "regulations" are needed here. But there is said to be another reason. A belief prevails that the famine has been purposely caused in order to force the city to enter into a contract for something like £1,000,000 worth of water from a private undertaking in which prominent politicians are largely interested. We need not more definitely indicate the concern in question, which will no doubt be readily recognized by those of our readers who have followed the New York Water Question as dealt with from time to time in our columns. Such a condition of things is monstrous; and we are not surprised to read that the Charter of the Company is being fiercely attacked in the Legislature.

ESSAYS AND REVIEWS.

UNPRODUCTIVENESS OF TRADE UNIONISTS.

THEY have in France a custom whereby, if a Minister should make, on a subject of importance, a speech which is especially approved by the Legislature, the text of that speech is ordered to be placarded throughout the country. We wish that, in somewhat similar fashion, an article in the current number of the "Nineteenth Century and After" could be printed in large type and pasted up in every public place in the kingdom. It is entitled "The British Workman and His Competitors," and is from the pen of Mr. William Woodward, the Architect. The article only occupies five pages of the review, but contains in that short space some facts concerning the influence of Trade Unionism on working men engaged in the building trades, that we take leave to think would somewhat surprise the general public, and might lead to a disturbing of the self-satisfied complacence of some of the gentry known as "Labour Leaders." It constitutes, moreover, in our opinion, a serious indictment of the employers in those trades, though not intentionally drawn up as such; for, that the condition of things which Mr. Woodward, from his own personal experience, describes as prevailing—and which, from observation, many of our readers can confirm—should be allowed to exist, argues lack of wisdom and courage upon the part of the employers.

After recounting the increase in wages, and the decrease in the nominal hours of labour, which the bricklayers, stonemasons, carpenters, and joiners have obtained during the past few years, Mr. Woodward proceeds to consider the effect upon the men. We all know the picture which the labour leader on the stump draws as to the physical and moral benefits which are certain to accrue to the working classes when they have obtained the Eight Everything programme. Well, in the building trades the men have practically got it. What do they do with it? This is what Mr. Woodward says:—

> We know that the men are paid at noon on Saturday, and that many of them are not seen again on the building till the Tuesday morning following. It may be that they have been studying the handiwork of their predecessors in the South Kensington Museum, or that they have been giving the benefit of their practical knowledge to some of the pupils at the technical schools, or have been doing a little work in the garden. That I do not know; but I do know that at the dinner hour on the Tuesday some of the men who have taken £3 or so on the Saturday cannot get their dinner till they have borrowed the price of it from the foreman; so that the increase of wages has resulted in loss of work to the master (itself of the utmost importance) and has conferred no benefit whatever upon the workman or upon his family.

One has only to keep an eye on the public-house, and on the paper-boys selling "All the Winners," to get some idea of where the wages go.

Apart, however, from this loss of efficiency, the question of how workmen spend their wages—though of considerable national importance—is not of so much concern from the employers' point of view as that of what they do to earn them. Mr. Woodward thus outlines the building labourers' day:—

> At 6.30 a.m. in summer, and 7 o'clock in winter, they commence work. They will first look around to detect whether or not there is a man who hath not a "ticket" to prove that he is a "Unionist." If one is found who is not a Unionist, the foreman is requested to immediately dismiss him, on pain of the whole of the men in that trade instantly quitting. The result may be imagined; the master has to succumb. Having successfully performed this little operation, and 8 o'clock having arrived, the men retire for their breakfast till 8.30. At 10.30 beer is served round to the men . . . and this refreshment enables them to reach 12 o'clock noon, for an hour's dinner-time in summer, and half-an-hour in winter. About 3 p.m. beer is again served round to the men, which sustains them till 5 o'clock in summer and 4.30 in winter, at which time they quit the job.

The hours are well enough; but how about the work done during them? The intervals for refreshment give some indication, but only an indication.

> A bricklayer in some kinds of work can well lay 1200 bricks a day; but in the ordinary run of work he can easily lay, on the average, 750. Rules, however, step in which absolutely fix him not to exceed 500. . . . Taking the men on the average, they do not give a return of more than four hours' real honest work per day for the eight hours for which they are paid.

Not only is this so, but the "demarcation" fraud is brought to a fine art.

> If a bricklayer catches a plasterer fixing a wall-tile 9 in. by 3 in., he is again at the foreman to stop it; not, however, if the tile is 6 in. by 6 in. . . . If the eagle eye of the plasterer observes a man fixing a fire-proof plaster material—that is to say, a man sent by the manufacturer of the material, and who is not a Unionist—off that man has to go, notwithstanding the important fact that he thoroughly understands that particular work, and that the ordinary plasterer does not. The resulting defective work has to be ultimately made good at the cost of the master or building owner.

Similarly, the bricklayer must not fix an odd piece of stone; "the mason leaves his legitimate work to come and set this piece of stone, whilst the bricklayer looks on, and perhaps smokes his cigarette."

All this petty *and successful* tyranny upon the part of the Union has a marked effect upon discipline, and on the demeanour of the men. "In times gone by, if a foreman were seen approaching a group of idlers, they would at once scatter and resume work; now they do nothing of the kind. They will stand idle and grin at the foreman or at anyone else, as much as to say, 'Now look at us. We are paid for working; we are not working; and what have you got to say?'"

The result of all this is, of course, that building is much more expensive work to execute than formerly (fifteen years ago the price inserted in tenders for the labour on a rod of brickwork was about £4; to-day it is £8), which, equally of course, means that rents must be higher for working men, as well as for everybody else, and the cost of production throughout all trades in the country be proportionately enhanced.

Whom have we to thank for this? Primarily, of course, the Unions; but somebody is responsible for letting Trade Unionism thus run riot over the building trades. Who is it? Over and above everybody, the London County Council (and the District Councils who have followed the lead), through their want, or fear, of adequate supervision, and through "the quiet toleration of organized idleness." So much for the economy of municipal trading. The quiet toleration of organized idleness on the part of those who elect you, and whom you employ, but for whose idleness you do not have to suffer; the ratepayers and the whole community do that. Exactly.

But what are the private traders about in putting up with the state of things that has arisen through this encouragement of the Trade Union skulker? Why do they not combine together, take the thing in hand, and put the Unionists outside the gates, if they will not work inside? No doubt it could be done if set about in a thorough and determined fashion, and if care were taken to put the true facts of the case before the public.

Mr. Woodward does not suggest such a step. He thinks the only hope of salvation lies in the fearless and thorough administration of a new and strong Act of Parliament designed to effectually protect from molestation those who are willing to give a fair return for a fair wage. He says:—

> I have no faith in appealing to the sense of manliness of the British workman. I have no desire to suggest the abolition of Trade Unionism; but one cannot shut one's eyes to the fact that our Magistrates and Judges have not dealt with picketing, with threats, and with words and deeds which have frightened and intimidated the honest workman, with that wholesome chastisement which was deserved. They have rather fallen back on the excuse that the law as it stands controlled them. And so I say, give them an Act which, while permitting any man to ask for whatever wage he likes for his services, and which will permit him to work as many, and as few, hours as he likes, shall unquestionably prevent his interference, in the slightest degree, directly or indirectly, with the man who, not caring to belong to a Trade Union, is desirous to do what is right—to earn 15s. or £1 extra per week in overtime for the benefit of his wife and children and for provision for old age. A breach of this new law should result, not in puny fines, which are immediately paid by the Societies, but in terms of imprisonment with hard labour, sufficient to act as a deterrent in the future.

Such an Act would be a valuable addition to the statute-book; but we do not see why employers should sit down, wring their hands, and pay through the nose, what time they are waiting for Parliament to pass the proposed measure. We wish that Mr. Woodward's article could be read, marked, learned, and inwardly digested, by a far wider circle of readers than is reached by our contemporary, extensive as is its circulation; for we should like that circle to embrace every ratepayer, taxpayer, and voter in the kingdom.

ELECTRIC LIGHTING MEMORANDA.

Resistance to High-Voltage Electricity Supply in London—Manœuvres of the Companies—Argument against Municipalism—Insolvent Metropolitan Municipal Supply Undertakings.

ELECTRICITY supply, as conducted by the London Electric Lighting Companies in the light of the most advanced principles, is not found to give unalloyed satisfaction to the public. There is trouble over the change of voltage from the original figure of 100 volts at the consumers' terminals to 200 volts, which, as is well understood, is the Companies' idea of an "improved" service. The story of this performance is told, from the consumers' point of view, in the "Pall Mall Gazette" for the 28th ult.; and an entertaining tale it is. The idea of doubling the voltage, of course, was originated by the Companies, who found that they would have either to lay additional mains, which would cost money, or increase the pressure, which would cost them nothing, in order to cope with their growing business. They naturally preferred the latter alternative, and proceeded to obtain permission to adopt it. The London County Council did not oppose the principle of the change, as indeed would not have been reasonable, seeing that it was becoming the vogue all over the country, and the newer Metropolitan electricity supply undertakings were all going in for the higher pressures. The Council nevertheless imposed terms on the Companies proposing to make the change, with the object of protecting the consumers from any expense in connection with an alteration which was to be solely in the Companies' interest. When they had secured the necessary sanction, the Companies set about procuring the consent of their customers. First they tried simply asking permission, promising that the light should be better, and that they would exchange new lamps for the old ones. This

device succeeded in a large number of instances; the consumers being generally willing to agree to anything in order to get a better light, which was badly needed.

Some consumers, however, proved recalcitrant to blandishment; and upon them the Companies proceeded to try threats. They issued circulars announcing that the change of pressure would be made, in terms that led many to believe that the public had no option in the matter. Where this "bull-dozing" failed, intimation was given that supplies at 100 volts would be discontinued. Failing this, again, the suppliers "selected a time when the Bank rate was between 6 per cent. and 7 per cent., and then asked their 100-volt customers for the immediate payment of sums in advance representing the estimated cost of their electric supply during the ensuing quarter." Simultaneously, the price of the unit was raised in these cases to the maximum permitted by law; while 200-volt consumers were being charged less than one-half this price. Thus it will be seen that the battle of the voltages was being waged with all severity as between the Companies and their obstinate consumers. The next move of the Companies was to give a very irregular and unsteady 100-volt service; but, not to be done in this way, one consumer at 100 volts has taken out upwards of 100 summonses against the Company supplying him, the upshot of which is still in abeyance. Meanwhile, many of the outstanding consumers, to prove that they were not inspired by unreasoning hostility to the Companies, offered to come to terms on the basis that they should get as much light for 1s. at 200 volts in the future as they had done at 100 volts in the past, the Company bearing all the cost of the change. To this the Companies would not agree—even refusing, it is said, to do such minor and necessary work as was absolutely required by the insurance offices to ensure safety from fire.

The difficulty was laid before the Board of Trade a year ago, and a request was made for an inquiry into the circumstances, with a demand for a reduction of price if the change to the higher voltage is made compulsory. This is an affair in which deliberate action on the part of the Department might be regarded as a virtue. During the months that have elapsed since the appeal was first addressed to the Board of Trade, matters must have simmered down considerably in the disturbed districts; and it is not to be wondered at if hopes have been entertained in more than one quarter that, by the time the official investigation could be held, there would be nothing left to inquire into. Such does not seem to be the case. Further delays being impossible, the inquiry was commenced last Friday, with what result cannot, of course, be known for some little time. According to the writer in the "Pall Mall Gazette," there is still a valiant remnant of protesters against being compelled to give up their 100-volt supply for one of 200 volts and upwards; but he admits that the Board of Trade are against them, while asserting that the London County Council are on their side. In this case, let him and his friends be thankful that it is not the County Council, nor a local authority, which they have to fight on this question. If it had been a municipalized service that had proposed this thing, who would have championed the undoubted rights of the consumers? Any compensation the Board of Trade may award to the 100-volt consumers is so much to be set off against municipalism.

The current issue of the "Electrical Review" contains a most important article on "The Question of Depreciation," in regard to electricity supply undertakings, which ought to be read attentively by every member of every local authority in the land possessing an investment of this kind. Incidentally, the article endorses our last week's reflections on the Fulham and similar ventures. With "the usual flourish of trumpets in support of municipal trading in electricity," this Fulham undertaking was opened, and the innocent ratepayers were assured that it is going to pay because five other Metropolitan borough speculations of the kind "show profits." If these undertakings, which include the electricity supply works of Hammersmith, Hampstead, Islington, Shoreditch, and St. Pancras, altogether representing a capital outlay of close upon a million sterling, provided for depreciation at the same rate as the prudent Glasgow Corporation do, there would be an actual loss of £20,500 a year to be borne out of the rates. If there is anything in accountancy, this loss will have to be paid yet. Our contemporary pointedly refers to the heavy fees charged by consulting electricians in the case of local authorities' electricity supply ventures. In the happily-defeated scheme for Tottenham, Edmonton, &c., the professional advisers provided for £23,000 on an estimated outlay of £345,000.

German Coal Resources.—As a result of interpellations in the Prussian Diet on the subject of the so-called coal famine which prevailed throughout Germany for several months during last year, the Government was induced to appoint a Commission to consider the question of the coal resources of the country, with a view to the suggestion of remedies which would obviate a scarcity of supplies of coal in the future. The report of the Commission, which has lately been presented to Parliament, is a comprehensive document dealing with the production and demand for coal, the export and import of steam coal and lignite, and the coal prices of the Upper Silesian collieries. The conclusions of the Commission are that the production of coal had been equal to the increased demand, and that, taking into consideration the position of imports and exports, the present output of coal in the State appears sufficient for existing requirements. The report of the Commission has been adopted; but a suggestion that the production seems ample for the future has been rejected.

THE HOUSING OF THE POOR—PROGRESS OF THE QUESTION.

Since Parliament met early in the year, a good deal of discussion has taken place (chiefly outside the House) of various aspects of the great question of the improved housing of the working classes. It had been expected that further legislation on the subject would be promised in the King's Speech; but this proved not to be the case, although the Government, being pressed on the point, explained that a measure of this kind might be forthcoming if there should be any prospect of dealing with the matter satisfactorily during the present session. The rapidity with which the political conscience of the country has ripened in this regard may be inferred from the fact that, whereas three or four years ago no national Party cared about the question, the danger is now lest rash and ill-considered nostrums should be adopted for dealing with it in the supposed interest of some Party. The reality of this danger is proved by the almost indecent haste with which the old Progressive majority of the London County Council, on the eve of the dissolution of this body, pressed forward and rushed through a big housing proposal involving heavy expenditure on several schemes of confessedly limited scope.

The process of ventilating the general question began with a Trade Union deputation to Mr. Walter Long, the President of the Local Government Board, the purpose of which was to advocate in particular an extension of time for the repayment of municipal loans taken up for rehousing purposes. Mr. Long, in reply, admitted the good of the work done during the last twenty years by local authorities in removing slums. He showed, also, that the question is a very much larger one than that of slum clearance, which is in itself a comparatively easy matter. One difficulty lies in the concentration of population in particular districts, where sufficient accommodation for the people does not exist and cannot be provided, either by the local authority or any other agency. It by no means follows that the easy nostrum which naturally enough commends itself to Trade Union politicians—that local authorities should be encouraged to build workmen's dwellings by extending the period for the repayment of loans—is one that wise statesmanship can support. To do so, would be to gravely increase the risks already incurred by the ratepayers, without their having adequate protection. The Trade Union politician is "the man in the street." He only sees the obvious and the immediate; and if a large number of working people want to find houseroom in a particular neighbourhood, he does not see why the local authority should not provide it at the public charge. It does not occur to him that sixty years is a tolerably long time to look forward to; and that before the expiration of this period the conditions will certainly be altogether changed—the Municipality finding themselves with empty houses on hand in one place and fresh calls arising elsewhere.

There are other ways of dealing with an emergency of this nature, besides the direct one. Incidentally, there is something to be said for such a relaxation of the Building Bye-Laws and Regulations adopted for rural districts which hamper the operations of employers of labour, landlords, and others, as would result in providing suitable cottage homes for country people at rents which they can afford to pay. There is no reason in the world why the cast-iron prescriptions of the pedants of Whitehall should stand in the way of country people housing themselves comfortably in wooden or earthen dwellings—such as their forefathers knew how to build with the materials readiest to hand—properly adapted to modern standards of sanitation. As it is, from all parts of the country comes the complaint that there are no cottages to be had. Parish authorities are afraid to close obviously insanitary cottages, because there are no others. And so country people are driven into the towns, where they can at least get a part of a house, because landowners in the strictly rural districts cannot afford to build cottages of the sound bricks and slate roofs required by the regulations.

Next in importance to the relief of the congestion of town populations in particular regions by rehousing on a more commodious scale, is that of providing greater facilities for the movement of the people to and from their work. Another Trade Union deputation has interviewed the President of the Board of Trade on this matter, requesting that the railway companies serving the great towns should be compelled by law to run workmen's trains up to the arrival time of 8 o'clock in the morning (the return journey to be made at any hour of the day), at special fares. This is another sample of the wisdom of the "man in the street." All railway companies everywhere are to be laid under the same obligations, whether there is any actual need for the accommodation or not, and irrespective of the consideration of remunerative fares. Here is the usual weakness of Trade Union Congress prescriptions. From the very quarter whence definite and specific recommendations for reforms in the workmen's interest might be expected, there comes nothing but vague generalities which a responsible Minister of the Crown can sweep away with a single pertinent question, raising a point of detail.

Meanwhile, it is interesting to note that almost the only fresh contribution to the polemic is due to Mr. Arthur Balfour, who has written an open letter in which he sustains the contention that "the improvement of means of communication" is "the most important element in the problem." Mr. Balfour's point is that people should bear in mind that "trams, railways, and

'tubes' by no means exhaust the catalogue of possible improvements in transit." He suggests that these familiar means of travel may not be those which in a few years will find most favour, especially for swift transit over relatively short distances. Mr. James Swinburne has advanced very similar views. What most hinders street locomotion at present, Mr. Balfour remarks, is the "want of differentiation in the traffic." This profound observation goes to the very root of the matter; yet it opens up a line of treatment of the street traffic difficulty which local authorities almost everywhere have systematically ignored. It is impossible for any observant person to ride on the top of a tramcar in any busy main thoroughfare without perceiving that even the slow horse trams can scarcely get into their stride for many yards without a check for some extraneous reason—usually a slow cart or van on the rails.

It has been remarked in these columns, with reference to the movement for the substitution of electric for horse traction on British tramways, that unless something is done to keep the tracks clear for the former, the system will not be able to do its best where a quick service is most needed. For this reason, we have favoured the idea of using side or diagonal thoroughfares for fast tramway traffic. As Mr. Swinburne has already said, however, and Mr. Balfour now argues, all transport systems which involve the use of rails and a rigid track are to the same extent defective. They can neither back freely, nor can one carriage pass another. It would clearly be a great advantage if the smooth running surface of the rail metal were spread over the whole width of the thoroughfare, so that the wheeled traffic need not run in rigid lines. Mr. Balfour therefore ventures on the bold suggestion that a radical cure for traffic congestion would be found in a system of special radiating thoroughfares, rigidly confined to the use of rapid (say, 15 miles an hour or over) traffic. The road surface would be designed, not for carts or horses, but for some form of autocar propulsion. No doubt the cost would be great; but the system would be free from many of the objections which apply to the boundless multiplication of suburban railways, electric tramways, and underground "tubes."

It has already been mentioned that the London County Council have adopted an extensive housing scheme. This is a tripartite design, comprising a town housing enterprise in Clerkenwell, an estate arrangement at Tooting, and an operation in land at Tottenham. The amount of capital involved in this programme is £1,500,000. It should hardly need to be argued that the attention of large ratepayers, and especially of those who are also large employers of labour, as gas companies, should be carefully focussed on all projects of this kind; for there is no knowing how far the rate-spending authorities may go in this way, now they are beginning to move. Since 1855, the Metropolitan Board of Works and the London County Council together have housed only 32,000 persons, at a capital cost of nearly 3 millions sterling. Evidently, if this movement is to proceed henceforward at an accelerated rate, the borrowing resources of local authorities will require considerable enlargement. Already, part of the new County Council scheme has been "blown upon;" Mr. Goulding, M.P., having succeeded in eliciting the fact that it is in contemplation to charge rents of from 6s. to 11s. per week for the Clerkenwell dwellings, which cannot be called housing the poor. There is clearly plenty of opportunity left for private enterprise to engage in this business; and the great employers of labour ought not to shrink from the trouble and responsibility of showing the way. It has been the practice of gas companies to take parliamentary powers to provide housing for their workpeople on their surplus lands; but a considerable extension of this policy appears to be indicated. Neither gas undertakings nor railway companies—nor, in fact, any other large employers of labour—will be justified in protesting against the extravagant housing schemes of inexperienced local authorities, if they themselves set a bad example in attracting large numbers of workpeople to themselves, and leave their housing accomodation to Fate and circumstances.

This is very much the view taken by Mr. Justice Grantham, in a letter to "The Times" of the 28th ult. The learned Judge thinks the root of the trouble lies in the fact of there being too many manufactories in London. He cites the examples of Doulton's pottery, "the Vauxhall and other gas-works," the engineering workshops, the furniture manufactories, and the host of other industrial establishments which might be removed to a distance, and the workpeople with them. London, it is suggested, should be an emporium, not a manufacturing town. If the raw material comes from one place, the coal from another, and the finished product goes into all parts of the world, why should London be plagued with the making? Of course, a good deal has been done in this way already. And what is true of London, is also true in their degree of many other large cities. They are all becoming less self-supplying than formerly. Small local manufacturing trades, as iron-foundries, tanneries, saw-mills, and potteries, are perishing. The work is being concentrated in places where it can be done more cheaply. The reason here is of an economical kind. Diverse causes, however, sometimes produce similar effects; and other than strictly trade requirements are competent to shift labouring populations.

Lady Jeune has also entered the controversial area with a suggestion for a Government Housing Commission, to deal by means of national resources with that enormous residuum of the general problem which would remain untouched after local authorities, employers of labour, and private enterprise had all grappled with as much of it as they could respectively tackle. Her ladyship is honestly sceptical of the good faith and ability of local authorities in this regard. They are too much open to suspicion of jobbery or are so incompetent that they have to learn through experiment and failure. And, we may add, when they are indifferent honest, they are prone to act from mixed motives. Like the London County Council, they wish to make soft jobs for Trade Union hands; or else they want to snatch a working-class vote. Or, like the Shoreditch Vestry, they wish to find support for an electric lighting scheme in their improved dwellings. Besides, and above all, they are not big enough or strong enough for the work. It is a large order to entrust the ratepayers' representatives with the reconstruction of a sensible proportion of the basis of local rateable value. Consequently, Lady Jeune suggests the handing over of the work to a Government Department, upon the precedents of the Charity and Ecclesiastical Commissions. The Housing Commissioners would be a small body of well-paid experts, appointed for life, and equipped with powers embracing the whole of the United Kingdom. Their capital would be provided by bond issues; and they would have powers for the compulsory purchase of landed and house property. The project is daring enough to take away the breath of a regular constitutional authority. At any rate, it is refreshing, in these times of the thoughtless glorification of Municipalism, to find one bold and clear voice raised to tell these overrated bodies their faults. "We see failure and inadequacy in nearly every scheme hitherto tried; and if any Government would seriously undertake it, they could carry it out and leave an immortal monument behind them." Thus Lady Jeune. Her ladyship's implied compliment to the National Civil Service is at least one of which its recipients may well be proud.

Here the public discussion of the subject stops for the present. The foregoing summary is a fair account of what has been said and done so far, this session, to advance the solution of the great problem of the housing of the poor in England; and if the amount of progress made is not large, the enormous bulk and complexity of the issues must not be forgotten.

LABOUR-SAVING APPLIANCES IN GAS-WORKS.

If a short phrase were required to fitly describe the last three decades of the past century's history of the gas industry, we venture to think "the labour-saving period" would not be inappropriate. Our pages have recently afforded abundant evidence that the gas-works of to-day are equipped in a very different style from those of the seventies; and the change has been brought about mainly by the introduction of labour-saving appliances. From the successful effort of Mr. John West to lighten the burden of the stoker, down to the introduction of the latest device for the expeditious conveyance of material, numerous proofs have been afforded that the minds of engineers and inventors have been seriously directed, and with beneficial results, to the supersession of manual work by some kind of mechanical operations.

We need not stop to discuss the causes which have led to this result. It is sufficient to recognize the fact that machinery now figures conspicuously in the equipment of gas-works, and to acknowledge that, to use an Americanism, it has "come to stay." The "iron man" has obtained a footing within the gates, and, as he is not under the domination of Trade Union officials, he is not likely to turn out on strike. As labour-saving machines have come upon us one by one, we do not appreciate their number and variety until they are brought under notice in a collected form by the aid of a technical paper or a series of special articles such as those which Mr. C. E. Brackenbury contributed last year to the "Engineering Times," and which have now been re-arranged and published in book form.*

The author commences with a short historical introduction, and then gives the reader an idea of what gas-works were like before the days of railway sidings for the conveyance of the raw material into them, and shows how this is done now. He next passes on to describe in detail the coal and coke conveying machinery, inclined retorts, stoking machinery, and coke-handling plant which are now familiar objects in gas-works. In the succeeding chapter, he explains the process of making carburetted water gas, and shows the plant employed in this operation in juxtaposition with the old kind. He also gives an illustration of the Dellwik-Fleischer plant at Königsberg. The concluding chapter is devoted to purifying plant; beginning with the first attempt at purification at Coventry in 1805, when lime was mixed with the water in the gasholder tank, and coming down to the double-stage house fitted with all the latest arrangements. The author concludes by expressing the opinion that, by making a judicious selection and combination of the modern labour-saving appliances he has described, economies may be effected, gas cheapened, and the general prosperity of the community increased.

The text is written in an easy style, and illustrated by sixty reproductions of photographs and outline drawings of plant, appropriately headed by a portrait of Murdoch. The book is well printed, neatly bound in cloth, and provided with a few blank leaves at the end for memoranda.

* "Modern Methods of Saving Labour in Gas-Works." By C. E. Brackenbury, Assoc.M.Inst.C.E. London: P. S. King and Son; 1901.

THE GAS COMMISSION OF MASSACHUSETTS.

In July of last year, we reviewed in these columns a series of articles on the "Gas Supply of Boston (Mass.)," contributed by Mr. J. H. Gray to the "Quarterly Journal of Economics." Our readers will doubtless remember that, owing to the chaotic condition into which the gas supply of its principal city had fallen, the State of Massachusetts, in 1885, appointed a Gas Commission to endeavour to evolve some order out of the chaos, and to regulate the future operations of the Companies in the interests of the consumers. That Commission—the only considerable and systematic attempt ever made by an American State to control the supply of gas—has, of course, the duty of supervising not only the Boston Companies, but also all those within the State of Massachusetts; and Mr. Gray has now contributed a further interesting paper to the same publication, relating briefly the events leading up to the appointment of the Commission, and, more fully, the history of its subsequent proceedings.

He prefaces his article by the remark that all those who followed his account of the financial and political manœuvres of the Boston Companies would be aware that the present relations of the Companies to the investor, the consumer, the Legislature, and the Commission are not by any means satisfactory; and adds that, the State's attempt at control not having been completely successful, some profit may be derived from considering what the various evils were that the Commission was designed to overcome, what steps were taken by the Commission to cure those evils or to prevent others from arising, and how far, and why, such steps failed in achieving their object.

The history of gas supply in Massachusetts, prior to 1885, is similar in essentials to that in the other States. Unregulated competition—or monopoly maintained by buying off, at the consumer's expense, threatened competition—was the order of the day. "Virtually no administrative control was exercised over these Companies by any American Commonwealth. . . . Rival companies, so far, had been the only weapon wielded in the supposed interests of the consumers. The direct fruit of such attempts was always the same—over-investment and a "rate war," followed by consolidation and unregulated monopoly, with prices usually sufficient to pay a dividend, not only on the unnecessarily large investment, but also on the watered stock occasioned by the consolidation." The result of this was hostility between the Companies and the consumers, leading occasionally to attacks upon the former by councils or legislatures, which, however, never benefited the public. But, generally speaking, the consumer was left to fend entirely for himself; while, in regard to public lighting, "the cities often exacted from the Companies such low prices as to make the prices for private lighting, under all the circumstances, necessarily high."

The cities were able to exact these lower rates in return for the right to supply; but even then were constantly at loggerheads with the Companies in regard to their charges. In the twenty years preceding the discovery of the water-gas process, the Companies were making ever-growing profits, owing to the great fall in the price of materials for manufacture and construction, and to the enormous increase in the consumption of gas. All this time, the accounts and the profits of the Companies were kept secret. Most of the Companies outside of Massachusetts watered their stocks freely, so as to keep the nominal rate of dividend within reasonable limits. Those in the State, where a law prohibited stock watering, paid the 10 per cent. dividend (beyond which they did not care to go for fear of rousing public feeling), extended their plant out of surplus profits, and then went to sleep. The Boston Gaslight Company, for instance, with a capital of $2,500,000, charged to revenue extensions of works to the value of $3,300,000 in fifteen years, and was in fact earning 20 per cent. on capital.

Prior, then, to the advent of water gas and electric light, the Companies easily earned large profits, even after buying off competition; and, though the public grumbled, there was no demand for State control or regulation. Then came the water-gas makers and the Electric Lighting Companies, and the scene was changed; these competitors, for their own purposes, stirring up public feeling against the Gas Companies by means of carefully arranged agitations against "monopolies, extortionate prices, inadequate services, fabulous profits, and antiquated management." The Gas Companies then suddenly discovered their need of State regulation. Says Mr. Gray: "It is interesting to note that, about this time, the subjects discussed at the annual meetings of the various Associations of gas manufacturers entirely changed. Competition occupied a prominent place in almost every meeting of this kind, and especially in the Presidential Addresses, for about a decade. The question before had been, How to prevent State interference. It now became, How to stimulate, direct, and control State interference so as to protect investments. The more far-seeing members of the Associations recognized . . . that a request for protection would raise the cry of 'monopoly,' which could be safely met only by an acknowledgment of the State's right to regulate the monopoly in the public interest."

By 1884, the water-gas interests had so stirred up public opinion against the old Companies, that the Boston undertakings persuaded the City Council to petition the Legislature to create a Board of State Gas Commissioners; and in 1885 such a Board was established by an Act which "has not been essentially changed, except by constantly enlarging the powers, functions, and duties of the Commission. The Commission consists of three members appointed by the Governor, with the consent of the Council, for terms of three years—one retiring each year. The Commissioners are removable for cause only, and after a public hearing."

The duties of the Commission at the outset were to generally supervise the actions of all the Companies in the State, and to see that they obeyed the law. "In order to provide itself with the necessary information to enable it to carry out this provision, it is armed with practically unlimited inquisitorial powers . . . . larger than have ever before been given in this country to any similar commission dealing with industrial or financial interests." The Commission may prescribe not only the form of the annual balance-sheets and reports to be made by the Companies, but also the methods on which the books and accounts are to be kept; and may require the Companies to keep such records as the Commissioners may think necessary. Upon the requisition of the City Authorities, or of twenty consumers, the Commissioners may, after a public hearing, order such improvement in the quality, or reduction in the price, of gas as they think fit. The Commission is the final Court of Appeal upon the question of whether a fresh Company shall be allowed to supply in any district. Violations of the law are reported by the Commission to the Attorney-General. The Commissioners have also the duty of making an annual report to the Legislature, and of recommending any necessary amendments or additions to the law.

The principal duties of the Commission may then be said to be that of revising prices, of keeping proper statistics, and of advising the Legislature. The first annual report dealt chiefly with the efforts of the Commissioners towards getting accounts properly kept; and on their recommendation, an Act was passed fixing a uniform financial year for all the Companies. The same Act also forbade the issuing of bonds below par or in excess of capital.

The first important case of any kind dealt with by the Commission, was a complaint brought against the Worcester Company, by the consumers, alleging inferiority in the quality of the gas supplied, and claiming a reduction. The Commissioners then laid down the principles on which they have since worked. They took it to be the object of their existence to obtain from a monopoly for the consumers the benefits previously sought to be obtained through free competition. They accordingly established the doctrine that a Company should not be allowed to charge a higher price than would, "with honest, progressive, and efficient management," give a fair return on the capital actually invested in the concern. In conducting inquiries into the circumstances and previous management of a Company, the Commissioners refused to be limited to the evidence tendered by the petitioners, "who in such cases rarely have any accurate knowledge of the cost of making and distributing gas," but, in addition, made a thorough examination into the history, policy, methods, and condition of the Company from its inception.

In the case of the Worcester Company, the Commissioners declared the price too high, ordering a reduction from $1·80 to $1·50 per 1000 cubic feet; the management to be "narrow and illiberal;" and the distributing system to be inadequate, requiring the expenditure of more capital. Some years later, the Board further reduced the price to $1·25, and recommended still greater expenditure of capital, but refused to sanction the issue of more stock for the purpose. The principle upon which the Commission founded this last decision was one set out in their tenth annual report, in which they declared that "the ordinary demands which a progressive management desires, and is bound to meet, may fairly be provided out of income, when the price of gas is not made so high as to be burdensome." This strange theory has naturally led to serious difficulties; for the inevitable result is eventually to produce the profits of a big concern with only a small capital on which to pay dividends, with the resultant difference of opinion as to who should reap the advantage—the consumer in a heavy reduction in price, or the shareholder in abnormal dividends.

In regard to two Companies, the Commissioners have ordered reductions in price—involving in one case a reduction in, and in the other the total loss of, dividend—on the ground that the Companies were inefficiently managed. In the first case the Board held that "an earlier management had, although keeping within the law, over-capitalized the Company, and that the present management, while honest, was inefficient." In the second, the Commissioners found that, through speculative management, improper leases, and absurd, if not dishonest, expenditure for patents, the Company had been greatly over-capitalized; and, declaring that "the burdens of reckless management belonged to the Corporation and not to the public," and "that the profits of Companies supplying this kind of public service must compare favourably with those which a new Company might need to pay a fair dividend, when fully equipped to render the same service," they reduced the price of gas 28 per cent.

The question of the Board's policy in prohibiting fresh issues of stock proportionate to increased plant and output, has been recently raised in the case of the Haverhill Company. That Company, having accumulated a surplus profit largely in excess of the amount of their capital, after having made all necessary extensions and maintained a 10 per cent. dividend, proposed to increase their capital from $75,000 to $500,000, by selling the concern to the Haverhill Gas Securities Company, formed with the same shareholders; the purchase money being provided out of enormous extra dividends paid. The Commission, to meet this act of defiance, have recommended the Legislature to cancel the Charter of the Securities Company, and have reduced the price to be charged by the Haverhill Company from $1·00 to 80 cents. The

Company have appealed to the Courts, on the ground that this price is unreasonable; and the outcome is awaited with interest. The immediate and (to them) highly inconvenient result is, however, that Commission and Legislature alike are being flooded with petitions for reduction of prices elsewhere to the same level.

In conclusion, Mr. Gray remarks that "almost every petition for a reduction of price has been acted upon favourably by the Commission, and that the reductions . . . have usually reduced, or even destroyed, dividends. This indicates that the Commission has had an important direct effect on the price of gas in the cases brought before it. Such a policy must have had a great effect, also, in causing voluntary reductions, and in preventing action of any kind on the part of the Companies likely to call forth petitions for price reductions. It goes almost without saying that temptations to over-capitalization will disappear if it ever becomes clear that the Commission has the inclination and the power to prevent the payment of dividends on an excessive capitalization."

The further workings of the Commission will be watched with interest, especially by consumers in the other States, who are only too familiar with the excitements and disadvantages of rate wars. But the costly and uncertain working of the Massachusetts Commission, however much to be preferred to the unregulated competition elsewhere reigning in America, is a very poor second to the automatic, and generally effective, operation of the sliding-scale in England.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 635.)

THE Stock Exchange had a very tame and uneventful period last week, and business in pretty well every department was on a much reduced scale; while in some it barely marked time. The settlement was a leading feature, to the exclusion of fresh business; and it appears to have gone through without producing any awkward situation. Despite the prevailing quiet everywhere, there was no tendency to droop; prices being, on the contrary, for the most part rather higher, and closing with a tendency to rise. In the Money Market, there was a good, steady demand, which, however, there was no difficulty in meeting, until the conclusion of the settlement and the close of the month, when a revulsion of marked easiness supervened. In the Gas Market, business was scarcely as active as it had been in the previous week; but transactions were a little more evenly distributed among several issues, and not confined to the big leading stocks. The general tone was very good; and a considerable number of quotations made moderate advances. It would seem as if people were not being at all perturbed by the reduced rates of dividend which the companies are perforce distributing as a result of the outrageous price demanded for coal last spring, but are perceiving how things will right themselves now that the pendulum has begun to swing the other way; while the intrinsic strength of the companies remains unimpaired. In Gaslight issues, the ordinary stock was moderately active and at steady figures, which never ranged wide apart, though the closing prices were not quite the best of the week. The secured issues were not much dealt in; but they were firm, and the maximum and the debenture advanced a point each. South Metropolitan was quiet and unchanged. Commercials were rather more active, and changed hands at better than middle figures. Actual transactions in the Suburban and Provincial group were scarce; but the tendency all round was excellent. Alliance, Bristol, Bromley, Crystal Palace, Newcastle, Tottenham, and West Ham had each a rise of more or less magnitude. Business in the Continental Companies was on a very reduced scale; but they were firm generally, and Imperial improved. Among the remoter undertakings, Bombay, Ottoman, and River Plate advanced. The Water Companies were quiet; and movements were slight and irregular.

The daily operations were: Gas opened very quiet on Monday; and the only move was a rise of 2 in Imperial. In Water, Grand Junction fell ½. Tuesday also was a quiet day. Bombay new rose ½. Wednesday developed some activity; but quotations closed without any variation being made. In Water, Lambeth fell 2. Thursday was rather quieter, but very firm. Several issues were marked *ex div.* at higher figures; and Alliance rose ½. Friday was a shade busier. Gaslight debenture rose 1; but Malta fell ½. In Water, Kent rose 2, and East London debenture 1. Saturday was strong and quiet. Imperial rose 2, Gaslight maximum 1, and River Plate ½.

"The 'Electrician' Electrical Trades Directory and Handbook for 1901," commonly known as the "Big Blue Book," has been issued. Many of our readers are familiar with the work, which has reached its nineteenth year of publication. The contents of the volume have, it is stated on the cover, been corrected up to the 4th ult. The publishers have been able to greatly extend and bring up to date their digest of the law relating to electric lighting, power, and traction, as well as to telephony; and a great deal of new matter, such as the standard forms of accounts, the Electric Lighting Acts, &c., has been added. Sketch maps are given, with details, of the areas of the various wholesale electricity supply schemes which have been sanctioned by Parliament or the Board of Trade. The directory section of the book has been enlarged, particularly in the home and colonial division.

PERSONAL.

Mr. JOHN BINGLEY, jun., a former pupil of Mr. John Eunson, of Northampton, and Chemist to the Bath Gas Company for the past two years, has been appointed to succeed Mr. W. G. Quicke, as Assistant-Engineer.

At the annual meeting of the South Shields Gas Company last Thursday, a pension of £175 per annum was granted to Mr. W. J. WARNER, who for 38 years held the position of Engineer and Manager of the Company.

Mr. J. W. ALLIN, who recently left the St. Helens Corporation Gas-Works, on being appointed Gas Engineer to the Chorley Corporation, has been presented with a handsome gold watch by the officials at St. Helens. Mr. Samuel Glover, the Gas Engineer, made the presentation.

Mr. JOHN B. KENT, who has held the position of Manager at the Wapping station of the Commercial Gas Company, has been appointed Manager of their larger works at Poplar. On retiring from Wapping, on the 28th ult., he was the recipient of a handsome testimonial, consisting of an oak canteen of cutlery and plate, subscribed for by the officials and employees, to mark their appreciation of his past services.

An interesting feature of the usual reunion of the Bath Gas Company's officials after the half-yearly meeting last Thursday, was the presentation by Mr. C. Stafford Ellery, the Engineer, on behalf of the staff, of a handsome Abney level and clinometer, suitably engraved, to Mr. W. G. QUICKE, on his appointment (already announced) to Perth, Western Australia, as a *souvenir* of their kindly feeling and good wishes. Mr. Quicke leaves London in the course of a few days to take up his new duties.

OBITUARY.

The death occurred last Wednesday, at Llandudno, of Dr. JAMES NICOL, who was the foremost figure in connection with the development of the town to its present proportions and position. He pioneered the agitation which resulted in the acquisition of the gas and water works by the Local Authority. He had reached the advanced age of 86.

The recent death is announced of M. EDOUARD DELAMARE-DEBOUTTEVILLE, whose name is well known in connection with the construction of large gas-engines. In collaboration with M. Malandin, he produced one of the best in France—the "Simplex." At the Paris Exhibition of 1889, he had a 100-horse power single-cylinder engine of this type, which was at the time the largest of its kind in Europe. In the Exhibition of last year, he showed, in conjunction with the Belgian firm of Cockerill, an engine (also single cylinder) giving 600-horse power when driven with blast-furnace gases. He died at his residence near Rouen at the comparatively early age of 45.

NOTES.

The Prospects of High-Flash Burning Oil.

It is remarked in the "Petroleum Review" that that curious twist of politics, the agitation for raising the flash-point of mineral lighting oils, seems to be showing itself again. The London County Council have received a report favouring the movement for raising the flash-point of burning oil; but petroleum experts point out that the course of the trade does not support the assumption of the practicability of making this change. The demand for burning oil with a flash-point of 100° and upwards is actually falling off. Only about 10 per cent. of the American oil imported into this country is of this grade; and the proportion does not increase. The importation of cheap Russian oil is increasing; but the bulk of the supply is not of a character to satisfy the high-flash advocates. There is a supply of high-flash Russian oil in the market; but it is stated that there is no trade in it. Consequently, it is contended that the agitation for raising the flash-point by legislation had better be dropped. Under the existing conditions of the supply, it would be impossible to make all the high-flash oil that would be required to meet the market demands. And even if this were done, a heavy oil produced by eliminating all the more volatile constituents of kerosene would burn very hot in the lamp, often overheat the burner, and cause more damage in the long run than the existing supply. Meanwhile the number of fatal and serious lamp accidents steadily tends to fall, thanks largely to the growing use of gas by the class of householders who formerly contributed most plentifully to the Fire Brigade record of oil fires and explosions.

The Keeping Properties of Acetylene.

Referring to the observations of Mr. E. L. Nichols ("JOURNAL," Vol. LXXVI., p. 1393) on certain characteristics of the acetylene flame, the "Engineer" gives special attention in a recent article to his statements respecting the loss of luminosity of this gas when stored over water. It is remarked that no gas can be stored indefinitely in a water-sealed holder. By the effect of varying temperature on the co-efficients of solubility of the stored gas, whatever it may be, and on those of the oxygen and nitrogen of the atmosphere, the confined gas continually tends to work its way

through the water into the outer air; and the outer air tends to work its way through the water into the holder bell. Thus the confined gas steadily decreases in quantity, and regularly becomes contaminated with atmospheric oxygen and nitrogen. In the case of acetylene, the usual impurities of the commercial article are less soluble in water than the pure gas itself; so that it deteriorates as well as loses by keeping. The writer offers some testimony of personal experience in regard to this phenomenon. The gas was generated in a hand-fed carbide-to-water plant, and stored under a pressure of 2½ inches in a water-sealed holder over a layer of olive oil about ½ inch thick, both water and oil having been exposed to the gas for months. The gas was made from time to time from the same sample of carbide; and some of it was kept from last September to January. Then the holder was filled up, and the gas allowed to stand for a month. In the end, it was found that the acetylene thus treated had lost 14·3 per cent. of its original illuminating power, or a fall of illuminating power at the rate of 0·45 per cent. per day. This experiment refers to acetylene of the highest possible commercial purity—that is, to gas made on the carbide-to-water principle, passed into a holder quite free from air, and stored in the most economical fashion over olive oil. The moral of this experiment is that acetylene should never be made long before it is wanted for use; and further that the flame of the gas is unsuitable for use as a photometric standard.

The Motor Car of the Present Day.

The development of the motor car in French hands is progressing along the lines often indicated here as those which must be followed if the mechanical carriage is to replace animal traction on common roads. It should have all the advantages of the horse-drawn vehicle without its inconveniences, which are exclusively those appertaining to the horse. It should possess as few as possible peculiar drawbacks of its own, and must be economical. Steam carriages would be the best if it were possible to use coke as fuel; but this expedient has been abandoned in the case of light carriages. The gas-motor, consuming petrol, is the most favoured type of automobile for the present. The consumption of fuel varies considerably, chiefly in proportion to the skill and care of the driver. About half-a-pint per horse power per hour seems to be the best result yet obtained. The cost of fuel, however, is only about a quarter of the total working expense of a motor car. More money is spent upon pneumatic tires than upon driving spirit and lubricating oil; and the cost of keeping a reasonably expert mechanic-driver is considerable. Still, when a man has to be a great deal upon the road, so as to necessitate his keeping more than one carriage and a stud of horses, the motor car is already more economical. It is the same at the other extreme, where a carriage is only wanted for occasional journeys; because it costs nothing for keep while idle. In other respects, besides economy, the petrol motor car is improving. The smell of the exhaust is being suppressed by improvements in carburettors; and the noise is being stifled. The partizans of the motor car have this hope to comfort themselves withal—that when they have definitely turned the corner of rivalry with horse traction and get in the ascendant, they will be able to demand an alteration of road-making practice to suit their own requirements. When the road is made for the motor car, and not for the horse, the further development of the former will proceed apace. An extensive employment of tar macadam, with a hard asphalt top-finish, is indicated.

The Radio-Activity of Matter.

M. Henri Becquerel has contributed to "Nature" a summarized account of the results of the studies of the property of matter known as radio-activity, which he discovered in 1896 while carrying out some experiments with the salts of uranium. He then observed that these salts emitted an invisible radiation, which traversed metals and bodies opaque to light as well as glass and other transparent substances. This radiation impressed a photographic plate and discharged from a distance electrified bodies; thus offering two methods for studying the new rays. The phenomenon does not appear to be influenced by any known external cause, such as a variation of temperature or a luminous excitation. It is entirely different from phosphorescence; is not weakened appreciably by time, even at the end of several years; and is emitted spontaneously without any apparent exciting cause. In 1898 the discovery of new radiating bodies gave a fresh impulse to these studies. It was found that thorium possesses qualities similar in this respect to those of uranium; and eventually a new element, called radium, was isolated through its possessing the property of radiating in an exceptional degree. Meanwhile, thorium was not neglected; and Mr. E. Rutherford has found that, in addition to their ordinary radiation, thorium compounds emit a very penetrating "emanation" that produces temporary radio-activity in substances in the neighbourhood, if the bodies are all uncharged. The radio-activity can be concentrated on the surface of thin wires, and removed by hydrochloric and sulphuric acids, which, being evaporated, leave the active portion behind. Thorium may perhaps owe a part of its properties to a new element, actinium, discovered in 1900 by M. Debierne, which is as active as radium. Some of the radiations from these active bodies are deviated by a magnetic field, which circumstance opens out a new line of studies. Altogether, M. Becquerel remarks, these experiments go to show that a new order of phenomena has arisen from the study of a new property of matter—radio-activity, the real nature of which is as mysterious as are the other properties of matter previously recognized.

COMMUNICATED ARTICLES.

AUTOMATIC IGNITION OF GAS.

By W. G. Hicks.

The automatic self-lighting of incandescent gas-burners, gas-fires, &c., is of such great importance, that the experience obtained in England with appliances for effecting this object will doubtless be of considerable interest, especially in bringing the subject up to date, and in continuation of the articles by M. Pierron of which an abstract translation was published in the "Journal" in October last year.

It is well to state at the commencement that an igniting medium has not yet been made which, if allowed to remain in the gas-flame, will continue active beyond a short period. The reason for this is that though the porous body may protect the platinum black, or any other active material deposited in it, this body will

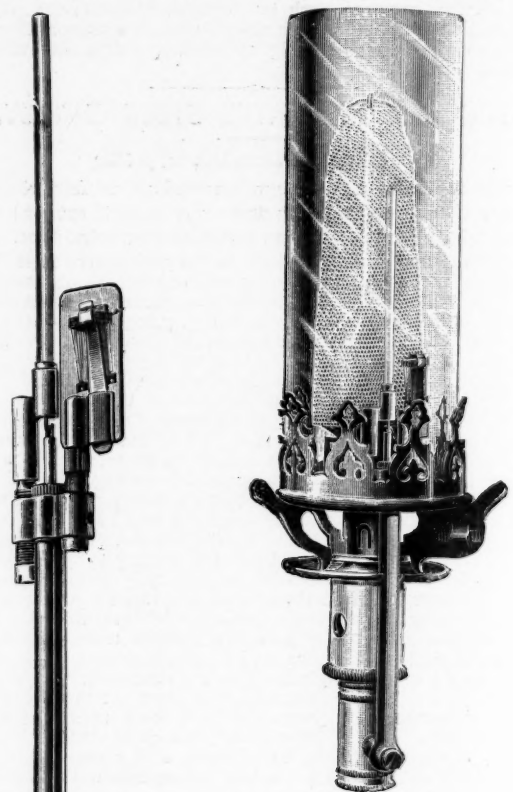


Fig. 2.

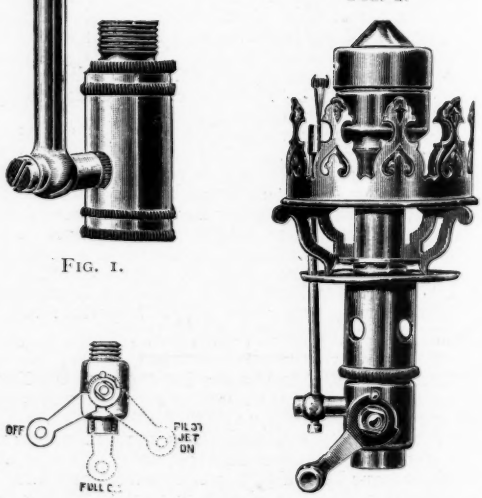


Fig. 1.

Fig. 3.

not light the gas without the aid of fine platinum or other wires or filaments, which must be exposed to the action of the flame, and therefore are soon destroyed, as is the case with lighters fixed to the mantles or at the top of chimneys of incandescent burners.

This leads to the conclusion that the igniting agent must be

kept from the influence of the gas-flame in one of the following ways: (1) By removing it from the flame of the main burner after it has been lighted, by means of the expansion of spiral springs or other similar mechanism, as shown in figs. 3 and 4 of M. Pierron's paper; (2) by using portable lighters for holding over the chimneys or above the gas as it issues from the burner, as in fig. 5 of the paper; (3) by employing automatic arrangements with double valve action, which is actuated by the expansion of metal or other rods exposed to the main flame of the burner when alight, using a bye-pass jet which is lighted by an ignition agent, and extinguished by the valve when the main flame is alight, as shown in figs. 1 and 2;* (4) by having valves or cocks with two gas-ways, actuated by hand in such a manner that in the first position the gas is shut off entirely, in the second it is on to the igniting agent but off from the burner proper, and in the third the burner proper is on and the igniting jet off, as in fig. 3.

With reference to the first form, the objections to it are that the main burner is turned on full, and if the ignition does not take place at once, a considerable quantity of unburnt gas passes into the room, creating an unpleasant smell, &c.; while with incandescent burners an explosion is also caused in lighting the mixture of air and gas, which soon destroys the mantle and chimney. Being in the flame, the mechanism becomes relaxed, and refuses to act; so that the igniting agent remains in the heat and is thus destroyed.

The second group of appliances, which includes all portable self-lighters of the class shown, are objectionable, for the following reasons: The gas is full on at the burner; considerable explosion is caused with incandescent burners; there is difficulty in finding the correct position in which to hold the self-lighter, especially in the dark, and by the time this is found the room is likely to get full of unburnt gas.

The automatic self-lighter shown in fig. 1 has been so improved since it was first put upon the market as to now constitute the ideal form of an automatic self-lighter; and when correctly handled it has been found to work perfectly. New discoveries in material, treatment, and processes of manufacture have produced the present self-lighting medium of unsurpassed efficiency. Gas-fitters have found difficulty in effecting the small adjustments occasionally necessary to keep the valve in proper position; but experience in dealing with the apparatus is rapidly removing this cause of trouble. It should be understood that every gas-cock used in connection with the appliance must shut off the gas entirely when it is out of use. The action of the automatic lighter is as follows: The gas-cock on the ordinary bracket or pendant having been turned on, the gas finds its way through the under side of the valve to the igniting agent, where it is lighted. The heat produced by the small jet burning expands a metal rod, and reverses the position of the valve—shutting off the ignition jet, and lighting up the burner. The whole process should take about seven seconds. It will be seen from this description that the igniting medium is only in the gas-flame for a second or two when the gas is first turned on, and that the lighter is always in its place when required; and the burner proper is not turned on until the ignition has taken place at the small jet, so that no gas can escape unburnt into the room.

The two-way tap form of lighter is quicker in action and has all the advantages of the automatic lighter, except that it has to be turned by hand, so as to put out the flash-jet and light the burner. A new cock has been designed for this purpose which has full gas-ways to both burner and ignition jet, and no slotting in the plug, so that it is not liable to get stopped up in use. The cock itself is made so that the wear is automatically taken up by means of a spring; and the plug will always work freely without the slightest chance of gas passing when the cock is shut. This is most important in connection with the self-lighting medium, as a slight leak of gas impinging on it when not in use is liable to saturate the porous block with gas to the exclusion of the necessary oxygen—causing delay in the ignition of the gas. The tube to support the igniting agent on these cocks is made tapered at the top, so that new agents can be put on by anyone with the certainty they will all fit. There is also a small screw provided, to regulate the pressure of gas on the ignition jet.

A great many imperfect infringing devices have of late been put upon the market, and would-be users should inform themselves on this point to prevent infringement, as well as to secure reliable self-lighters. The flash-light method employed with the automatic and two-way tap is the only perfect way of lighting incandescent burners, as there is no explosion when the burner is lighted, which would soon destroy both mantles and chimneys. All the systems where the main burner is lighted direct from the self-lighter (as in figs. 4, 5, and 6 in M. Pierron's article) are open to this objection; and the portable form of self-lighter to the further objection of the difficulty of finding the correct position over the burner. There is also the fact that the burner is full on; and if the self-lighter does not act quickly, a very unpleasant quantity of unburnt gas passes into the room.

The new pattern two-way tap self-lighter is so simple and perfect in construction that a child can work it, and renew the igniting medium. In fixing, the only care necessary is to regulate the pressure on the ignition jet by means of the small screw at the base of the side tube, so as to get a jet averaging 2 inches long, which, when alight, should play on the side of the mantle. The joints under the fixtures should be made gas-tight by tiff white lead or cardboard washers. Fluid paint, &c., should be avoided, as it is liable to get into the working parts.

In conclusion, it may be mentioned that these self-lighters have been in use in many places for more than two years without renewal, and have effected great saving by doing away with the unpleasant bye-pass jet continually burning, besides removing the risk of explosion where escaped gas might come in contact with a lighted jet, as was the case recently at Westminster.

* The apparatus illustrated in M. Pierron's paper must now be considered of an obsolete pattern.—W. G. H.

RADIANT HEAT FROM DIFFERENT VARIETIES OF GAS-FIRES.

SOME UNEXPECTED RESULTS.

By Thos. Fletcher, F.C.S.

Radiant heat is by no means an easy matter to measure correctly, except with fires of exactly the same pattern, under the same conditions. The reason is that radiant heat travels in straight lines only; and the slightest difference in the sides, top, or bottom may (by absorption or reflection) seriously alter the result. A gas-fire set in a recess, formed by tiles, will appear to give a better result than without the recess; but this is caused by the heat being reflected and concentrated forwards.

A stove was made in Germany some four or five years ago, which gave an intense beam of radiant heat in one direction only; and it required some time to convince buyers that this great warmth was only in one narrow track. Outside this, absolutely no warmth could be detected; and, like many other much-advertised new departures, it died a natural death, and was discarded. It was very expensive; and it was, to many, "though lost to sight, to memory dear." Makers have to follow the fashion; and although the great heating power of the old incandescent iron-spray fire was known to many, the introduction of the hollow balls ended its popularity.

The actual amount of radiant heat from the different classes of fires has never been previously determined; and the figures obtained from the same fire, under precisely the same conditions, are of great interest. Each fire was allowed half-an-hour after lighting before the temperatures were taken with a black-bulb thermometer *in vacuo*—the only method by which pure radiant heat can be correctly measured. Probably all that can be said in favour of the old iron-spray fire will never bring it into fashion again, but there are certainly some who will understand and appreciate the figures here given—

Pattern of Fire.	Gas Consumption per Hour.	Rise of Thermometer 3 Feet from Fire Surface.
Asbestos fibre	27 cubic feet.	41°
Ball fire	26 ,, ,,	41°
Iron spray	23 ,, ,,	54°
Radiant reflector	24½ ,, ,,	46°

Calculated out, the above shows a comparative cost for the same amount of radiant heat: Iron spray, 100s.; asbestos fibre, 153s. 3d.; ball, 149s. 8d. As a matter of fact, in practice the fashionable ball-fire at its best adds 50 per cent. to the cost of a gas-fire, as compared with the iron spray, which, although dull-looking, is the most economical source of radiant heat at present known.

The radiant reflector has nothing in common with the old reflector stoves except in its appearance. Its great power is well known to users; but the figures given above cannot fairly be compared with the fires, as the sides are enclosed, and the radius heated is not quite so wide as that of the fires, although there is no doubt of its efficiency and economy in actual practice. The gas consumption of each was chosen as being the best, at full power, for the one tested. If an air-warming arrangement had been used, the total duty would no doubt have been the same in all cases; but as the radiant heat is the only form utilized in practice in at least 90 per cent. of all gas-fires made, the results are of the utmost importance to all users.

When the same fires are turned down low (to a gas consumption of 8 cubic feet per hour), the results, as regards the ball-fire, are even worse than at full power, as will be seen—

Pattern of Fire.	Gas Consumption per Hour.	Rise of Thermometer 3 Feet from Fire Surface.
Asbestos fibre	8 cubic feet.	15½°
Ball fire	8 ,, ,,	8°
Iron spray	8 ,, ,,	16°
Radiant reflector	8 ,, ,,	14°

The asbestos fibre and the iron fret, both being practically flat surface fires, retain their relative power—the asbestos fibre even increasing; but the ball-fire falls behind most seriously, costing (for the same duty) twice as much as either of the other forms.

The reason of the low duty of all ball-fires is simple. Most of the radiant heat is produced in the body of the fire; and it is stopped to a certain extent by the balls in front—disappearing as radiant heat, and making its way up the flue instead of into the room.

So far as my experience goes, the ball-fire has attained a popularity far beyond its merits. At least 70 per cent. of the fires made are of this class; and it may be taken that not less than two-fifths of the total gas burnt in these will be wasted. The fashion holds, and no doubt will hold; but the facts ought to be known to those who wish to study economy rather than fashion and appearance.

GAS MATTERS IN THE UNITED STATES.

In the last letter sent you, I expressed the opinion that before long something would happen to the prices charged for gas in this country—with the consent of the companies if they gave it, by their initiative if they had good sense, in spite of their refusal if they declined to make concessions. The "something" has possibly happened; a small panic seems to have stricken the boards of directors in the States. It began in a small up-country town in Vermont, close to Canada. The town saw its opportunity, and used it; there was no pretence of honesty, honour, or even common fair-play on either side. Said the town: "We have paid you individually $1·45, and collectively $1·30 per 1000 cubic feet these many years. This price is too high. Reduce it." "We cannot; we can hardly make the business pay as it is." "If you do not, we will take away your privilege of free landing of the coal, and your right of way to waggons in the city park." So the Company made a compromise. No sooner was this done, than someone sent a terrible letter containing a threat to rattle a whole bag of bones and declaring that the affair was an attempt by a "New York Syndicate" to do sundry dark and devilish things to the gas corporations in which the "infinitely trifling incomes of the widows and orphans in New England originate." It is said that the people of the town are rejoicing at the reduction of the price of gas; but the subject has suddenly become taboo in the village.

Proposed Municipal Gas Supply in New York.

A scheme has been started here in New York City to commit the Municipal Authorities to making gas. It goes so far as to permit the condemnation of the existing properties, and all the rest of it. The man who stands for it in the State Legislature is a certain Senator Donnelly—a name interesting in a number of ways to gas interests here. It is not quite evident who stands for him, nor whom he stands for. There is not the least likelihood that the Bill will pass; and it is quite certain that the Governor—Odell is a Gas Company's President—will veto it. Two opinions have been expressed on the subject—one that the Bill is a "stand and deliver;" the other that it is "pure fad." In either case its career will be watched with interest by all, or nearly all, the gas companies in the State.

In this connection, I have obtained an item of interest. The great New York Company, the "Consolidated," are about to put the price down to $1 per 1000 cubic feet, as a flat rate. This will take the wind out of the Donnelley-Flynn-Hoyt kite too quick. In fact, there is little or nothing which they could do which would so disturb the plans of the "anti-civilization-fragment" of the Democratic party as thus to reduce the price in the very face of the A.C.F. declaration, that, having established a complete monopoly of the supply, they intended to put up the price. This is one of the wisest plays the Company could make—may be the wisest.

A Terrible Gas Explosion.

During the week, the first serious accident in connection with the new underground has happened (a gas explosion) and a number of men have been killed, and many more badly injured—at least, so said the "Journal." It seems that the Engineer in charge had that very morning warned the men against naked lights, and was arranging to have electric glow lamps put into the tunnel. If this is really true, there must have been some intimation of the condition of the atmosphere in the hole. It is also declared that safety lamps—regular mine pattern—were being issued to the pick-and-shovel men when the man with the ordinary lantern went into the tunnel. The facts may come out at the inquest which will be made later (when it can do no one any good); but they are being concealed as far as possible now. At the same time, stories are current; and little by little the facts leak out. According to these stories, there were two gangs working in the drift—one using the light of the glow lamps, the other aiding the electricians to put up more, when some one entered with an ordinary lantern and—the usual result followed.

The question agitating the informed is, What was the gas which exploded? This, indeed, is exceedingly important. During the past year, there have been quite too many of these accidents to be interesting. Hardly a single large city has escaped. In some instances, the mischief has been serious; in others—as in the case of the "Merchants' Row Explosion" in Boston—there was much bleat but little wool. Philadelphia has had one or two in which people were injured; Albany has had two, I think; and Brooklyn, reckoned in with New York, makes it impossible to say how many, although I have information of one serious one. But recognized explosions in "New York City" will reach fully twenty of various importance during the past year. In fact, it is nothing uncommon to pick up the morning paper and read that an explosion happened thus, and so many were injured, and the property damage was so much. I have figures collected which I intend to use later to some purpose; but the following is germane. These explosions may be divided into three classes—those happening in the manholes of the electric light conduits, those in sewers, and those in excavations. These last—the explosions in excavations—may be divided into those caused by the Gas Company's men in excavations made in the known neighbourhood of gas-pipes, and those made by the ignition of gas by labourers lighting their pipes under conditions usually perfectly safe. Of these last, there have been a number of various importance; the one at the "underground" really belongs in this class. In regard to the sewer ignitions, the decision by the experts has never been reached; the newspapers decided that the gas was "sewer gas" because the explosions were in sewers. Those in the conduit wells are usually credited by the papers to marsh gas; but this can hardly be so. In the case of the cellar excavations, it certainly has been marsh gas in a few, but by no means in all.

During the summer there were quite a number of accidents in the conduit wells; and the line-men of the Telephone Company were in a small panic, and even went so far as to try the wells by throwing in lighted matches or putting a lantern on a pole to lower it into the well, before they risked their own lives. In a few instances considerable explosions followed, but expended their energy in the air without much disturbance; the manhole covers being off. In a few cases, where the covers were off and the smell of city gas was very pronounced, the men would wait until the smell was dissipated; but occasionally, when in a hurry—telephone men can hurry—they would "try the air" with a candle. Sometimes the result would be a demonstration of the danger from which they had escaped, at others no explosion would follow; but in a few instances ambulance calls to suffocated men have shown that the danger from explosion is by no means the only risk. In a number of cases it has been my good fortune to see men opening the manholes of the conduits; and when I notice them doing this, I always wait to see if there will be a smell of gas, and if so how much, or if there will be an explosion. I have not had the pleasure of seeing any explosions; but I rarely miss the smell of gas.

This smell is distinctly that of illuminating gas; and whatever be the something to which the smell of illuminating gas is due, that something is present at these wells. After a time, I began to carry in my pocket the means of sampling the air of these pits; and since May I have made more than a score of such samplings. These samples have been carefully examined in every case. The oxy-hydrogen used for explosion was always made by electrolysis of water; and the oxygen was always habitually in excess. Usually I added H_2 to the bulk of the suspected gas and O_5 or O_6, according to the amount judged by the strength of the smell to be present. In probably a third of the cases hydrocarbons other than methane were present in measurable quantity; but usually the figures showed CO and CH_4, and of other hydrocarbons traces only. In every instance there was a smell as of illuminating gas.

The construction of these pits causes the use of a large amount of gas tar to be employed in and about them; and they are as nearly isolated from the soil as any space can be. I do not know just how the lengths of the pipe forming the conduits are joined; but the men insist that they are sealed up air-tight. If so be they are, there is no communication of any sort between the interior of the conduits and the spaces in the soil which might contain gases; and the gases would have to be produced in the conduit or the manhole-pit. But I question the accuracy of the information, from facts within my own observation. While not doubting the honesty of the men's intention, I am inclined to question their knowledge. I am certain that I have often seen the pipes so laid that they were by no means air-tight, and were so circumstanced that gases could certainly enter. Yet the intention by the words of men in authority would seem to be to isolate the conduits completely from any access of ground water or ground gases; and yet beyond all doubt gases usually found in the ground are there. Still this question, "Do the explosive gases enter from without, or are they formed within the conduits?" is by no means settled. You understand, these conduits for telephone, telegraph, and electric light wires are all built according to a specification prepared by the Central Authority—the Board of Electrical Control; and the construction and operation is inspected by them.

Of course, there is no need to comment on explosions made by the gasmen. When they excavate a pipe, they are presumed to know what they are at, and, knowing their danger, to act accordingly. This brings me to the last species of explosion. These are always more serious than the others. Not only has there been greater property damage, but there has been loss of life in a number of cases; and the question of what gas formed the fuel is really important. In these cases, the newspapers, with their usual encyclopædic knowledge, have decided that the gas is illuminating gas escaped from the mains. Were this so, the gas companies would be in a way to blame; for surely they should see to it that their mains were gas-tight. In a few instances, I have obtained air from excavations which smelled "gassy," and have found the gas in it in sufficient quantity to prove the presence of CO and CH_4 and C_6H_6 (may be). At least, I have exploded the regular explosion mixture in contact with the air of such excavations, and found that, after explosion, there was present CO_2 and more H_2O than could be accounted for. In no case was there any great quantity; but there were large traces. I may have more to say about this margin of accuracy some day. But it is utter nonsense to say that illuminating gas will account for all the explosions. It may—perhaps does—have to answer for a few; but in the greater proportion, some other source must be found for the fuel. In a number of instances, it was beyond doubt marsh gas; in other cases it was not. It has been an easy thing to get air from excavations on Long Island made in the soil of a region in former times a swamp, and from (by the filled-in creeks) soil which was full of decaying matter of various sorts; and from these samples other hydrocarbons than CH_4 were easily

shown to contaminate the air. But the filled-in swamps of Brooklyn, Long Island City, and Newtown are not the sands and rocks of Manhattan Island. The question of interest really is: "Was the gas which took fire and exploded in the R. T. Tunnel (R. T. is rapid transit, official for the N. Y. underground) illuminating gas escaped from the Consolidated's mains by reason of neglecting ordinary precaution; was it the gases of decomposition of the soil; or was it illuminating gas which had leaked in consequence of unavoidable injury to the gas-pipes from some cause unknown?" It stands to reason that the Consolidated will try to throw the burden of the mischief on someone else—maybe the "electric roads," or the lighting companies—and if so, we will get the matter ventilated *multitudine cum imprecatorum;* for no end of expert witnesses will be called upon to swear, true or false, that these things be thus, or so.

There is one part of this question which is scientifically very interesting—the presence of CH_4 in a sort of hardened mud which is found some 18 feet below the sea-level in a large basin near the Harlem. This basin must date back long before the "great ice age;" and in the clay layer which forms its bottom is a layer of hardened loamy clay. If this layer is broken through—it is now more than 10 feet thick—those excavating find a greasy layer. This layer has a smell suggesting blue shale when heated; and if heated in a Rose's crucible with the tube luted in, a considerable quantity of gas can be collected. This gas is inflammable at a very low temperature; for it often takes fire spontaneously at the end of the tube. Analysis shows that it is CH_4 mixed with some member of the ethylene series; the latter in small quantity only.

It would be interesting to discuss the question of the formation of inflammable gases from the gas tar used to waterproof the conduits, under the influence of the ground currents caused by the single-wire trolleys; but for the present I let this pass, for reason of the lack of data.

An American Thermal Unit.

I have just returned from Ohio, where I have been to see a coal property; and while on my trip I had an experience. The town to which I went has one of those large sectarian schools called "Universities" in vulgar parlance. These schools are usually endowed by men who have grown rich on the unearned increment of the neighbourhood, and, as absentees, are hated and suspected by their neighbours. On this account, a certain class of cheap newspapers, and still cheaper politicians, see fit to call them nurseries of monopoly, and locally this very well endowed institution is known as "The United Coal Barons' College." One of the Professors in the school read a paper in a local society on the price of gas; and the next day a newspaper came out with a scare headlined space story, "A Professor in the Coal Barons' College says gas costs less in England than in America." This was published in the paper about 4 p.m. We reached the village about 7 p.m.; and looking about a bit, noted the air of suppressed excitement—the public meeting air of the place, which is due to the hotel bar in an American town being the usual club-room and only public lounge, as is the inn in an English village, for that matter. I had not been there many minutes before I caught on. This public were angry; a Professor in the Coal Barons' College had vilified this great and glorious land. Had he not said that gas is cheaper in England than here?

It was a matter of a few moments to see that public opinion was already divided; one camp was for making a protest against the Professor for slandering his country, the other was for finding out if the Professor had told the truth. The first thing I distinctly understood was: "What are you going to do about it?" The reply came: "Find out if it is true?" "Suppose it is true, what then?" "Make you reduce the price of gas."

Just at that minute one of the men who owned the property we had come to see entered with a companion who said: "Say, Smith, do you believe this story about the price of gas in England is true?" Smith said: "Ask this man here; he is a Britisher, and knows more about it than I do." "What is the story?" I inquired. He handed me a paper; and I read the following: "Professor Curtis has been comparing the price of gas in this country and England; and he finds that in this country we get 575,000 B.T.U. for $1, while in England they get 1,025,000 for the same. That is, in England they pay $0·97½ for a million B.T.U.; while here we pay $1·74 for the same amount." "Yes; that is quite likely," I said. "The idea of anything being cheaper in England, that is that way, I would not wonder if it affected the next election."

Just then a man came up and said: "What is B.T.U., any way?" The man who had handed me the paper said: "I asked the Professor about that, and he told me it was the way they measure heat. B.T.U. stands for British thermal unit. This is something like buying coal according to the amount of heat you get out of it, instead of by the ton." "What have we to do with British thermal units? Are not American thermal units good enough for us?" "But we have not any, so we use the same one as the rest of the English speakers do." "My brother-in-law is in Congress. I am going to write to him about an American thermal unit."

No doubt this is awfully silly; but, soberly, from what I have seen here, I would not be surprised at all if the result should be an affirmation of some sort of unit by Congress. It would be just as well if they would, and define the latitude, since the pound will vary unless a spring-balance is used; and the spring-balance should have a latitude unit. This and the difference in the burettes should be settled somehow. It will make very little difference where the zero is, so long as we know where it is.

Condition of the Gas and Water Mains in New York.

It may be that the fact that we are at last to have an "underground" in this city is known to you. For years the project has been in agitation, and at last it has been begun. When the plans were made, the proposition was to form "pipe galleries" alongside the railroad tunnels, but in the same excavation, so that all the pipes could be laid where they could be got at without pulling up so much pavement. This plan was ill-digested. No one had taken the trouble to inquire how it would apply to the present conditions; and finally it was given up—certain of the newspapers said not wisely, but the engineers in a position to know do not share the notion. From time beyond memory, the periodical upheaval of the streets has been a cause of complaint; and something is needed to remedy the condition of things at present existing on both sides of the river. But it can hardly be believed that this is in any sense the thing. Some discussion of the subject was begun; and a few men who are engineers with leisure have been making a study of the whole situation—feeling that a question which is now in their youth purely academic may in the not distant future be vitally important. From one of these the following facts have been obtained. Presumably his statements are reasonably near the truth; but since there are no maps showing the location of all the pipes accessible to the public, every assertion made by anyone is subject to question. In fact, it is said by some persons in position to know that not even the engineering staff of the city have the record of the sizes of the pipes in the public streets, and their location; and it is alleged that more than once the gasmen—*i.e.*, the street force—have found pipes not located on their maps, and have failed to find others which were located. There have been a number of incidents mentioned in "safe" places of pipes being of a size other than the supposed record. This sufficiently indicates the confusion, which is certainly a surprisingly confused confusion.

Of course, everyone who has read the American papers with any attention during the last few years knows that some time ago the great Company—the "Consolidated"—built a tunnel under the East River to get from their works in Long Island to Manhattan Island, as the land they owned within the city proper was not enough to accommodate their plant with the needed additions and huge holders, and other apparatus was collected to handle and distribute the product after it reached the city proper. Starting from this tunnel's mouth, they had laid out a distributing system gridironing the city pretty completely, and believed that they had passed through their period of construction, and could rest.

Then this plan was proposed by somebody who evidently knew nothing of the real situation, except that the gasmen pulled up the pavement every little while—viz., to lay a huge pair of pipes from one end of the island (Manhattan) to the other, and to connect the cross street system with this, bringing the ends of the E. and W. pipes into contact with new main communicating-pipes along the river side—that is, along the East River and the Hudson, or, as it is commonly called here, the North River. On paper, such a plan would work magnificently; but on the mud and rock of the island—— This, however, did not seem to enter the heads of the doctrinaires who devised the beautiful scheme.

The fact of the case is that the present pipe system, which no doubt needs revision, like a paper-made Constitution, has been the growth, not of ages, like the British Constitution, but of years. It has grown by the system of "makeshifts, increasing the supply of a district by laying a new main pipe a little larger than the old one," or by laying a second main alongside the first, when this seemed better. Into this system of anomalies and compromises, this precious piece of legislation was intended to force order, not the order of experience and theory, but the kind somebody—De Wet Clinton, I think—wished for when he laid out the city northward from Bleecker Street. His plan is no "thing of shreads and patches," but a Minerva-like plan; and most unfortunately for New York it was carried out almost entire. The wiseacre plan the Commissioners proposed was to gridiron all New York with gas-pipes—just as it is now, in fact, only by a definite system. What means were used to convince the Commissioners that this absurd scheme should be given up (perhaps some engineer explained that pipe systems are not made, but grow) has not transpired; but, fortunately, it has been abandoned. Most unfortunately, another and important, absolutely needful, improvement went with it—the scheme for making order out of the chaos of the Water Department's arrangements.

If the theoretical condition of the gas-pipes is wonderful, the actual condition of the water-mains is damnable. On this side of the city we were threatened with a famine of good, clean water for a while last summer; but in the main part of the city, Manhattan Island, they never have anything but mud and dirty water. In fact, the water of the city supply is so bad that, unless filtered, it is utterly unfit for drinking by man; and the drivers of the stables say that horses who are habitually watered in Brooklyn have been known to refuse Croton water. The truth of the matter is simply this: The Water Department badly needs a man at the head of it who will do his whole duty, regardless of consequences to himself or anyone else. Unfortunately, nothing can be done without the help of the Water Department; and this they do not want to give. Notwithstanding all the logs and other obstructions in the way, some progress has been made. An investigation by

private parties forced the authorities to act, or at least to seem to act, to this extent.

From what they have consented to see, it would seem that fully one-half of the water delivered to the Island Borough runs to waste. How much longer this state of things will be permitted it is not easy to guess; but the papers may take it up again when they are weary of their present fad, and then the constituted authority may act. But until pressure of some sort comes, the present conditions will continue. No one unfamiliar with the condition of the mains can form a really intelligent opinion; but there is hardly an excavation made in the streets which does not find a leaky water-pipe, and instances are known where the leak was so serious that the Department had to repair the pipes before it could order the filling in of the hole that the water had made. These leaks do not show on the surface; but once in a long time, because of the geology of the island, the escaped water simply runs away into the sand, and thence into the river, unless by chance the leak happens to be in a hollow surrounded by rocks, in which case, if the sewers are full of holes, as they usually are, it escapes this way on reaching their level, or if the sewers are sound makes trouble of some sort, and after millions of gallons have been lost is finally discovered. There is nothing in which local authority—very local—is needed more than in this very department. The Water Board is so very far away from the individual that, like two planets, their paths never approach, as such would imply catastrophe of some sort.

The Danger oe Electrolysis.

Judging by the rather heated remarks made about your editorial on water-pipes and stray currents to be heard in the city, you must have wounded some people's self-conscience seriously. Mr. Dabney and his Committee have certainly done well; they have not only proved their point, but they have placed the trolley on its defence. But the damage to gas-pipes is quite as serious as the injury to water-pipes; and the consequences may before long be even more grave. So real, indeed, is the danger, that many of us have wondered why a proper fight was not put up. Some of us were also greatly pleased at your editorial in this relation. There is an immense satisfaction in hearing another unconsciously say the thing said by one's self; it strengthens one's conviction. Every word of your leading article is absolutely true, and has been proved so again and again.

Incandescent Gas v. Arc Lights in Fog.

Another capital remark of yours is the one in regard to the failure of arc lights (as compared with Welsbachs) in fog, for lighting streets. There is no doubt about its value at all times; the Welsbach is always the better, but it takes a fog to show how very superior it is. However, we want some exact figures on the power and penetration; and the only way to get them is by powerful long-distance photometers. These cost money; but they can be made, and the facts will justify the outlay.

The Theory of the Water-Gas Process.

You also deserve thanks for publishing the translation of the "Theory of the Water-Gas Process." The more of this sort of thing there is, the better. Strange that before this there has practically been nothing available, on this subject, at once satisfactory and accessible.

Flueless Gas-Stoves.

Have the gas companies taken any official notice of the injury done by the flue-without gas-stoves? We are likely to have action in this country leading up to legislation by which the offering for sale of heating appliances without suitable flues will be made a misdemeanour. Such action is needed. There is no more excuse for the use of the gas-stove in a close room than for the famous charcoal fire in a brazier. The effect upon the air is, of course, very similar. They both kill; so far their action on the human individual are identical.

The number of accidents from gasoline stoves used to be the proof of the number used; the list of accidents from gas-heaters seems destined, at the present time, to be the best evidence of their popularity.

The Labour Question.

Your editorial on the cause of the troubles at the Port of London is very much to the purpose. It would apply here in a way; only the port is less crowded, and has more mechanical appliances. But tell me, Magnus Apollo, what will you do with the human brute when you have eliminated him industrially? He, like rats, reproduces his kind much faster than the useful horse. What will you do with him when there is no longer work for him to do—feed him on largess, as they did at Rome, establish public granaries for his benefit, or will you "permit him to cease from troubling," as we do stray curs?

Manchester and District Junior Gas Association.—The next meeting of the Association will be held on Saturday evening, the 9th inst., in the chemical laboratory at the Salford Gas-Works, by permission of Mr. W. W. Woodward, the Gas Engineer to the Corporation. Mr. L. G. Barber, of Salford, will read a paper on "Some Analytical Tests Made in a Gas-Works Laboratory;" illustrating it by introducing most of the important chemical apparatus used, and also by some experiments.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The Annual Meeting of the Institution was held last Saturday, at the Mosley Hotel, Manchester. At the commencement of the proceedings, Mr. T. N. Ritson (Kendal), the retiring President, occupied the chair. The members mustered in very respectable number.

Minutes Confirmed.

The Hon. Secretary (Mr. S. S. Mellor, of Northwich) commenced the proceedings by reading the minutes of the meeting held on Nov. 24 last at Southport; and they were confirmed.

New Members.

The names of two candidates for membership were next introduced. They were Mr. George B. Smedley, of New Mills, and Mr. G. E. Stevenson, of Long Eaton. Both were unanimously elected.

Report and Accounts.

The Hon. Secretary then read the annual report and statement of accounts. In the former, the Committee congratulated the members on the continued prosperity of the Institution. During the year nine new members were elected, one died (Mr. J. H. Buckley, of Formby), two resigned, and one retired under Rule 17; leaving 140 members on the roll. The proceedings at the meetings during the year were recorded; and in the final paragraph it was remarked: "The Committee experience difficulty in getting papers for consideration and discussion at the meetings. Many members have promised papers, but, unfortunately, when the time of the meeting approaches, they find difficulty in fulfilling their promise. The Committee think that many of the members take too serious a view of the matter of paper reading, and would recommend the members to take into consideration the question of offering premiums, or any other method, of getting over this difficulty." The accounts showed a balance in hand of £52 5s. 7d.; and there were outstanding subscriptions at the date of the accounts of £15 16s. 6d.

Mr. T. Duxbury (Middleton) moved the adoption of the report and accounts.

Mr. A. H. Smith (Darwen) seconded the motion; and it was agreed to.

The Retirement of the Hon. Secretary.

The President said one point which arose out of the report had reference to the balance in hand of £52 5s. 7d. It would be remembered that twelve months ago, the question of the disposal of the balance was mentioned at the meeting. Various proposals had been before the Committee; but none of them had met with an exactly unanimous vote. There was, however, one which he was sure would meet with the members' approval. They all regretted that Mr. Mellor was about to retire from the position of Honorary Secretary, which he had so honourably filled for so many years; and the Committee thought they could not do better, to show their appreciation of his very able services, than vote him a little present of ten guineas as a small recognition of the work he had done. They could scarcely pay him for the work he had accomplished in connection with the Institution. It involved an immense amount of labour; and perhaps no one saw its actual amount so much as the Presidents.

Mr. John Chew (Blackpool) remarked that, if the President would make it 15 or 20 guineas, he would second it.

The President agreed to the 20 guineas.

Mr. R. Hooton (Ashton-under-Lyne), Mr. Arthur Graham (Mansfield), and Mr. W. W. Hutchinson (Barnsley) supported the proposition; and it was carried by acclamation.

Mr. Mellor thanked the members very much for their kindness; observing that the vote was something he never expected. He might say that he had occupied the position for twelve years; and it was to him, in some measure, a wrench to drop out of it. It had been twelve years of pleasure and of work, but work that, to some extent, he enjoyed.

Official Elevations and Appointments.

On the motion of Mr. R. G. Shadbolt (Grantham), seconded by Mr. H. Townsend (Wakefield), Mr. Arthur Graham was raised to the dignity of Senior Vice-President.

Mr. Graham acknowledged the confidence of the members.

Mr. James Braddock (Radcliffe) proposed, and Mr. R. Merrell seconded, the appointment of Mr. S. R. Ogden (Blackburn) as Junior Vice-President.

The proposition having been agreed to,

Mr. Thomas Newbigging was returned to his office of Hon. Treasurer, on the motion of Mr. W. W. Hutchinson, seconded by Mr. Ogden.

Mr. Newbigging expressed his gratitude to the members, but said it would have been consonant with his views if they had now elected someone else. He thought it desirable and necessary sometimes that a little fresh blood should be infused into the Executive. He also took the opportunity of adding his testimony to the way Mr. Mellor had carried out his work as Secretary.

Mr. MELLOR said the next proposition related to the appointment of his successor; and in putting the name of Mr. J. Wilkinson, of Drighlington, before the members, he might say that he was sure Mr. Wilkinson would fulfil the duties of Secretary quite as well as he (Mr. Mellor) had done. The position was one that was both honourable and onerous. Few people knew, except those who had passed through the mill, where the onerous part came in. In Mr. Wilkinson they had a gentleman who would do his duty to the Institution well. He was younger than he (Mr. Mellor); and an office of this sort required new blood occasionally to infuse a little enthusiasm into it. During the time he had been Secretary, the number of members on the roll had increased from 75 to 140.

Mr. TIM DUXBURY, in seconding, remarked that, though they were losing a good man, he had every confidence that Mr. Wilkinson would follow on satisfactorily to the members.

After a few remarks by the PRESIDENT, the motion was unanimously agreed to.

Mr. WILKINSON, in responding, promised to strive to follow in the footsteps of Mr. Mellor. He was happy to say that during his first year of office, he would have the assistance of Mr. Mellor; and it would be a pleasure to him to have as President such a gifted gentleman as Mr. Wood.

Mr. MELLOR explained that the next business was the election of two gentlemen to serve on the Committee in place of Messrs. Ogden and Wilkinson, who had been transferred to other offices. To facilitate the business of the meeting, the Committee had selected for nomination Mr. A. H. Smith and himself. The Committee were kind enough to suggest him for the Junior Vice-President, but he could not see his way to take the office at the present time. He had, however, offered to serve on the Committee for three years.

Mr. F. BARRETT (Ramsbottom) seconded the motion.

Mr. R. SURTEES, considering it was time North Staffordshire was represented on the Committee, proposed that Mr. W. Prince (Stoke-on-Trent) be elected to fill one of the vacancies.

Mr. F. A. WINSTANLEY (Rotherham) seconded the motion.

Mr. Mellor's name was then proposed by the PRESIDENT, seconded by Mr. S. GLOVER (St. Helens).

There was much discussion over the matter, in the course of which Mr. Mellor offered to retire; but the members would not hear of it. Eventually, it was decided to settle the matter by ballot; Messrs. T. Newbigging and J. Chew being appointed Scrutineers. The result was that 46 votes were recorded for Mr. Mellor, 36 for Mr. Smith, and 25 for Mr. Prince.

The Auditors (Messrs. J. E. Lamb and W. Severs) were duly re-appointed.

THE NEW PRESIDENT.

The PRESIDENT said it gave him great pleasure to introduce his successor, who was a gentleman known to all the members and to the gas profession generally. He referred to Mr. Charles Wood, of Bradford. He (Mr. Ritson) could not retire from the chair without expressing his best thanks to the members, to the Committee, and to Mr. Mellor for the very cordial assistance they had rendered him during his year of office. He was afraid he had not filled the chair exactly as he could have wished; but he hoped the Institution had not suffered at his hands. The office was going to be handed over to a gentleman who, he was certain, would safeguard its prestige.

Mr. WOOD then took the chair; and met with an enthusiastic reception. He at once proceeded to deliver the following

INAUGURAL ADDRESS.

Gentlemen,—Permit me to express my appreciation of the honour you have conferred upon me in selecting me for your President this year. It has been our privilege to hear many able addresses from former Presidents, most, if not all, of whom have been older and have had a longer professional experience than myself. I can only assure you that during my term of office I will do my best for the Institution, which, I trust, may have a most prosperous and successful year.

Let me first say that I feel it my duty to urge upon you the importance of the amalgamation of the Gas Institute and the Institution of Gas Engineers. We are, I am sure, all agreed that it is not to the best interests of the profession that two such distinct bodies of gas engineers and managers should continue to exist. Let each one, therefore, do his best to bring about a re-union, and to form one Association which, while retaining in its rules and mode of procedure all that is best in both, shall abandon whatever has been found to be detrimental to the true progress of our industry.

The choice of new subject-matter for an address is somewhat difficult, when every important topic is so ably treated in the many articles and addresses, which are so admirably presented to us by our technical journals. The present occasion is not, in my opinion, a suitable one for the introduction of subjects which, although important to the managers of comparatively large gas undertakings, are not of equal immediate interest to those engaged in smaller works, where the conditions are, in many respects, entirely different. Nor do I purpose giving you my views on the general position of our industry at the present time, or attempting to prophesy as to the possibilities of the future; but I intend to confine my remarks chiefly to a few questions to which my special attention has lately been given, and which, I hope, may be of some interest to all of you. I must, however, make a passing remark upon our progress during the last year.

Only a few works have, up to the present, published their returns for 1900; but these are, on the whole, decidedly encouraging. I find that the quantity of gas sold shows an average increase of nearly 5 per cent. upon the sales in the previous year. This is, I think, a matter for congratulation, when we consider the advances in the price of gas and the comparatively mild winter we have had. I am sorry that we have not been so fortunate in Bradford; but the cause of this is easily explained. The city is almost entirely dependent upon one branch of the textile industry, which has recently been passing through a period of depression. The year 1900 has been one of the worst on record for the city. Mills have been running short time for most of the year; and a very competent authority has stated that between £5,000,000 and £6,000,000 have been lost in Bradford during the last twelve months. In spite of this, our sales of gas for the year only show a decrease of 1·91 per cent.

A large amount of my time during the past three years has been occupied by the consideration of various schemes for the purchase by the Bradford Corporation of several of the local Gas Companies' undertakings. I do not wish to discuss at any length the vexed question of the relative advantages of corporation *versus* company ownership of gas-works. There is much to be said on both sides; but I have little personal experience of company management of gas-works. There are certainly many things in the average corporation administration that would, in my opinion, be better performed by directors having a personal share in the concern, though I believe that even gas directors do not always show a keen interest in the proper equipment and control of their works, so long as they can obtain their maximum dividends. There are good and bad gas companies in this respect, just as there are good and bad corporations. We all know instances of well-managed gas companies' undertakings, which could certainly not be conducted better in the true interests of the public, and would probably not be as well managed, if they were in the hands of the local authorities. In cases such as these, no one of the present generation, except the shareholders, would probably derive any benefit from the transfer, at the high prices which would have to be paid.

The gas consumers in Bradford are, however, in a somewhat exceptional position—as I shall presently explain—and consequently the ratepayers are unanimously of opinion that the whole of the gas supply ought to be in the hands of the Corporation. Even the Directors and shareholders of the local Gas Companies are, I believe, almost all of the same mind; but unfortunately their estimates of the value of their property seem to increase in proportion to the supposed anxiety of the Corporation to purchase the concerns—at any price.

The Corporation are fortunate in having owned the Bradford Gas-Works since 1871, in which year the then existing works were purchased at the comparatively low figure of £220,000. The quantity of gas made in that year was 571 million cubic feet. At the end of our last financial year, the capital indebtedness stood at £474,494. The quantity of gas made during the year was 1795 million cubic feet; so that our capital was only 5s. 3·42d. per 1000 cubic feet of gas made. Gas has been sold in Bradford since the transfer at fairly cheap rates; and during the last few years most of our extensions of works, mains, and services have been charged to revenue. During the period of the Corporation ownership, the Bradford gas consumers have contributed to other Corporation Departments, and to the cost of the public street lighting, a total sum of £797,580. So that the long-suffering gas consumers may now, I think, fairly claim that they ought to be relieved from all further charges of this kind for the future.

When the Bradford Gas Company was bought out in 1871, their district of supply only included the then borough, which had an area of 7220 acres. Bradford was enlarged in 1873, in 1881, and again in 1899; the area of the city now being 22,843 acres. On each occasion districts were added which were being supplied by separate authorized Gas Companies. Last year, therefore, we had consumers in the city obtaining their supply from the Corporation and from seven outside Gas Companies, all of which charged different prices. This state of affairs has caused a large amount of discontent, especially at municipal election times.

In my opinion, our present position gives rise to far more complaints than would be the case if the city were supplied by several gas companies; for such companies would be more indifferent to popular agitation than is possible with an undertaking controlled by a municipality.

Negotiations with several of the Gas Companies having been unsuccessful, it was thought advisable, in 1899, for the Corporation to apply to Parliament for compulsory powers to purchase those portions of the three Gas Companies' districts which were then within the city. This application failed. Last year, the city boundaries having been further extended by the inclusion of fresh districts supplied by four additional Gas Companies, the Corporation again endeavoured to negotiate with each of them; but, failing to do so, again applied to Parliament for compulsory powers—this time to purchase the whole of the undertakings of four of the Companies and to compel a fifth to sell gas in bulk to the Corporation. In London we agreed upon terms with one Company; but the portion of the Corporation Bill asking for compulsory powers was thrown out by the Committee of the House of Commons, to the great disappointment, as I believe, of the Gas Companies concerned.

There the matter stands at present; and we have now seven different scales of prices for gas within the city, which is supplied

from fifteen manufacturing stations. There is little prospect of these anomalous conditions being remedied until the Companies are prepared to take more reasonable views of the financial values of their undertakings.

Although incandescent street lighting has been somewhat exhaustively dealt with by others, I shall probably be expected to say something about my experience of it. We have had the system in use on a fairly large scale since 1895, and have now 10,346 lamps, all of which are incandescent. We have tried, I believe, every available kind of burner, mantle, and anti-vibrator, and have experimented with every method of ignition I know of.

I am sure that in one respect, at any rate, our system will be considered antiquated by many; and you will probably smile when I say that we use ladders for lighting every one of our street lamps. After careful and exhaustive tests, we have altogether discarded the use of bye-passes, pilot lights, and torches. The whole of the street lighting in Bradford is carried out, and the entire expense is borne, by the Gas Committee, even including the payment for gas supplied to some of the lamps by six outside Companies. It has been therefore a most important consideration with me to adopt the best and most economical methods of working. We obtain several advantages from the use of the ladder. As you are well aware, mantles vary considerably in size and shape during their lives. So that while one No. 3 Welsbach mantle may require $3\frac{1}{4}$ cubic feet to give the maximum amount of light, another which is somewhat shrunk will give its maximum efficiency with $2\frac{3}{4}$ or even $2\frac{1}{2}$ cubic feet of gas per hour. It is obviously a waste of gas in the latter case if the lamp governor is allowed to pass the full quantity for which it is regulated; but this is unavoidable if the lighting is done by means of a torch of any kind. After lighting the burners, our men turn down the lamp cock until each burner give its maximum amount of light. This they can easily do from the ladder, likewise change any broken mantles, or adjust any that may have been shaken out of position.

By any other method of lighting incandescent street lamps, nothing of this kind can, of course, be done. The burners are frequently left flaring up; or, if a mantle is entirely broken, either the lamp is left out altogether, or the man climbs up the pillar and probably damages another mantle in attempting to put it on. Each man does the whole of the work necessary for 80 single-burner lamps, including lighting, extinguishing, cleaning, renewing mantles, and changing broken lanterns, for which he receives 24s. per week. The cost of labour is thus 15s. 7d. per lamp per annum. If we employed bye-passes, we should save very little in labour—certainly not more than 3s. per lamp annually; while the extra value of the gas used by the pilot jets, at the rate of $\frac{1}{3}$ cubic foot per hour, would amount to more than this.

By using a suitable torch, we might save the 3s. per lamp; but the damage to the mantles in actual use, and the impossibility of any adjustment of the gas or mantle, quite outweigh, in my opinion, this small consideration.

For several years our accounts for new mantles have compared favourably with those in other towns. The average number of mantles used per burner each year has been as follows:—

	Average Number of Burners.	Mantles Used per Burner.		Average Number of Burners.	Mantles Used per Burner.
1895 ..	100 ..	5·64	1899 ..	2,190 ..	3·02
1896 ..	230 ..	4·31	1900 ..	6,570 ..	4·33
1897 ..	1,060 ..	3·14	1901 ..	11,334 ..	—
1898 ..	2,050 ..	3·04			

Until the end of 1899, nearly all the lamps were fitted with two "C" burners. Last summer we extended the incandescent system to the whole of the lamps in the city, and have fitted No. 3 "Kern" burners into the ordinary lanterns. Some of these lanterns, especially in the districts recently added to the city area, have since been found to be unsuitable for incandescent gas-fittings in exposed situations. Bradford being very hilly, a large proportion of our lamps are necessarily placed in exposed positions, and are consequently subjected to severe strains in rough weather. We are therefore at present engaged in making several desirable alterations in the lanterns, and in the method of supporting them on the pillars. After these are completed, I hope that we shall not use more than four mantles per burner per annum. Even if we find it necessary to use six or eight mantles, in order to maintain the lamps in good condition, the extra cost will not be a serious matter.

I consider that our plan of making each lamplighter entirely responsible for his lamps is much better than the one adopted in many towns—viz., having additional men to attend to the burners and to renew the mantles. With such an arrangement, the usual difficulties of apportioning blame for any carelessness arising from divided responsibility must necessarily occur frequently. Our results with incandescent street lighting have been such that I think no one need hesitate to extend the system over the whole of any district.

To render the use of incandescent gas-burners more popular with ordinary consumers, I am convinced that we shall have to employ men to keep their burners in order, and that this can be satisfactorily worked in such a way as to be self-supporting. With the cheaper and better burners and mantles which we may soon expect, the development of this branch of our business should prove very important to us. But let me here give a note of warning against the use of the many inferior burners and mantles that are now upon the market. I am sorry to find that even some firms of old-established reputation do not hesitate to push the adoption of these goods by highly exaggerated claims, such as we might expect from the vendors of quack medicines. Such practices ought to be beneath the dignity of the firms to which I refer.

The question is often asked: "What effect has the supply of electricity had upon the sales of gas?" and it is one to which a definite answer is by no means easy. The Bradford Corporation, having been the first in this country to establish a municipal electricity works, and having supplied electricity continuously since September, 1889, it may perhaps be interesting to give a few particulars of the progress of this department. As, however, this topic has been a favourite one with gas engineers for some time past, I will be as brief as possible. Until fifteen months ago, both our gas and electricity undertakings were controlled by the same Committee; and whatever may be the effect of such an arrangement in other towns, the advantage in Bradford has certainly been on the side of electricity. Electricity has been sold at practically cost price; and the department has been paid for most of the street lighting which it has undertaken. At the same time, we have been obliged to charge such a price for gas as would enable us to pay for about 98 per cent. of the public lighting of the city, in addition to the annual contribution of large sums towards the expenses of other Corporation departments. The average amount taken in this way from the Bradford gas consumers during the last ten years has been £34,985 per annum.

The charge for the last two-and-a-half years for electricity for lighting purposes has been $4\frac{1}{2}$d. per unit, less $2\frac{1}{2}$ per cent. discount, and includes a free supply of lamps. The net prices of gas for the thirteen years previous to June 30, 1900, varied from 1s. 11§d. to 2s. 3d.; but in July last, the price was advanced 3d. per 1000 cubic feet, owing to the increased cost of coal.

The following table [see next page] shows the annual output of gas and electricity for various purposes since the commencement of the Corporation electrical supply.

You will observe the steady annual increase in the number of units sold for private lighting; but the most striking feature in the table is the enormous progress which has been made in the quantity sold for motive power. We cannot, of course, hope to compete with electricity for tramway work, as this is entirely a new field, and one for which electricity is peculiarly adapted. But the average annual increase in the sale of current during the last five years for motive purposes other than tramway traction, is no less than 93 per cent.; and I am informed by the Corporation Electrical Engineer that the sale this year will even exceed the quantity sold for private lighting. This is a matter to which we, as gas engineers, ought to devote very serious attention.

Hitherto it has been only in towns of considerable size that the competition of electricity has been felt; but let me remind you that, if the various large schemes of high-pressure distribution are successfully established, many small towns, where the price of gas is necessarily high, may be affected to an even greater extent. Allowing 25 cubic feet of gas and one unit of electricity as a fair working average per actual horse power per hour, the sale of electricity in Bradford for the year 1900 would be equivalent to 23,306,000 cubic feet of gas.

The price now charged in Bradford for power ranges from 2d. to 1d. per unit; the average price paid last year being 1·22d. The average net price paid for gas used in engines during the year was 2s. 2d. per 1000 cubic feet; so that electricity thus costs twice as much as an equivalent quantity of gas for doing the same amount of work. We must, however, remember that actual prime cost is not the only important factor. The great convenience in the application of electricity to almost all of its many uses, its cleanliness, the small amount of attention required, the facility with which a motor or light can be switched on or off, and the small amount of space occupied by the motor, account for a good deal of the public favour which electricity receives. It is also possible to employ several separate small motors, each directly connected with one or more machines, so that any or all of the motors can be worked under a full load. Electric motors, when working under half or quarter load, are proportionately much more efficient than gas-engines under similar conditions; the actual efficiency of a good electric motor at quarter load being about 80 per cent. of its efficiency at full load. All these considerations are advantages which certainly, in many cases, outweigh the superior theoretical economy of the gas-engine.

The Corporation let out on hire electrical motors from $\frac{1}{2}$ to 60 horse power at annual rentals varying from £1 10s. for the $\frac{1}{2}$-horse power to £20 in the case of the 60-horse power motor. These rates are calculated at 10 per cent. of the actual cost; and there are now 609 motors in use, having a total brake horse power of 2622. This system, of course, offers a strong inducement to users of power to adopt electricity for their requirements.

In Bradford we have 501 gas-engines, the largest being 40-horse power; and the quantity of gas used by them last year amounted to 71 million cubic feet, which is equivalent to about three times the amount of electricity sold for a similar purpose. Nine gas-engines have been displaced by electric motors.

If we are to successfully compete with electricity in supplying this class of consumer, we shall have to offer equal facilities and supply on hire gas-engines of the best possible type. But there are many difficulties in the development of such a scheme.

In the domain of public street lighting we have nothing whatever to fear from electricity, if we are ready to avail ourselves to the utmost of the possibilities of the incandescent gas-burner.

In Bradford, as I have already stated, all our gas-lamps have been converted into incandescent; and we are now getting more than twice the amount of light we obtained under the old system,

Year Ended Dec. 31.	Electricity Sold.										Gas Sold.		
	Arc and Incandescent Lighting.		Motive Power.		Tramways.		Public Street Lighting.		Total.		Private Consumers.	Public Lighting.	Total.
	Units.	Increase per Cent.	Units.	Increase per Cent.	Units.	Increase per Cent.	Units.	Increase per Cent.	Units.	Increase per Cent.	Cubic Feet (Millions).	Cubic Feet (Millions).	Cubic Feet (Millions).
1889	22,449	..	..	..	..	..	..	..	22,449	..	1245	118	1363
1890	108,102	..	..	..	..	..	..	..	108,102	..	1266	131	1397
1891	239,361	121·4	..	..	..	..	..	..	239,361	121·4	1268	139	1407
1892	362,632	51·5	3,222	..	..	..	..	..	365,854	52·8	1366	141	1507
1893	461,148	27·1	19,346	..	..	..	..	..	480,494	31·3	1308	144	1452
1894	525,749	14·0	28,884	49·3	..	..	..	..	554,633	15·4	1328	147	1475
1895	637,780	21·3	35,919	24·3	..	..	..	..	673,699	21·4	1460	149	1609
1896	754,220	18·2	54,972	53·0	..	..	4,431	..	813,623	20·7	1445	149	1594
1897	859,944	14·0	117,176	113·1	..	..	16,468	..	993,588	22·1	1465	137	1602
1898	979,753	13·9	205,243	75·1	202,019	..	32,291	96·0	1,419,306	42·8	1460	138	1598
1899	1,275,214	30·1	463,630	125·8	618,282	..	59,004	82·7	2,416,130	70·2	1533	142	1675
1900	1,466,321	14·9	932,268	101·0	953,496	54·2	76,445	29·5	3,428,530	41·9	1515	123	1638

and at a slightly less total cost. That the alteration has given general satisfaction to the public is, I think, evident from the following incident: A Sub-Committee, consisting of members from the Finance, Gas, Electricity, and Tramways Committees, was appointed a few weeks ago to consider a proposal to extend the system of electric arc lamps to all the main thoroughfares in the city. Expecting a severe contest, I provided myself with various statistics, but at the meeting was pleasantly surprised when the Chairman of the Electricity Committee (who is not a member of my Committee), after a very short discussion, proposed the following resolution: "That, in view of the excellent results obtained by the use of the incandescent system of gas lighting, which has been applied to all the gas-lamps in the streets of the city, it is inadvisable to sanction the erection of additional arc lamps at present." This was unanimously carried.

To obtain some idea of the effect of electricity upon the demand for gas, I have carefully examined our sales in the principal Bradford streets. Nearly every shop in our chief street uses electricity; and I find that, comparing 1900 with the year previous to the Electricity Department being established (1888), the total sales of gas in this street show a decrease of 23½ per cent. Taking those premises alone in which electricity is used, the decrease is 29·8 per cent.; while among the remainder, the gas consumption has increased 9 per cent. This is in a street containing principally drapers' and similar shops. In another important street in the centre of the city, I find a decrease of 7·7 per cent. in the twelve years.

While speaking of electrical matters, the possibility of serious injury to our gas mains and services from electrolysis suggests itself. In America, as you are aware, this has become a grave trouble for gas companies. I was told by a gentleman, who only returned from New York a fortnight ago, that he had seen in that city alone, miles of gas and water pipes which had been taken up, having been destroyed by electricity escaping from tramway circuits. Electric tramways are now being rapidly extended in almost every town in the country; so that this new danger is a matter for the consideration of all of us. I am very glad to see that Mr. Livesey is taking up this question in his usual masterly manner.

In Bradford, we have had several miles of electric tramway in operation for two-and-a-half years; but so far I have not been able to detect, with certainty, any damage to our pipes from electrolysis, although we have had one pipe entirely melted by electricity which had escaped from a faulty cable. This immunity may be accounted for by the fact that nearly all our gas-mains are laid under the footpaths; and hence any escaping electricity would have a considerable distance to travel to reach the pipes. This plan should always be adopted in streets where tramways have been, or are likely to be placed. One very important feature in connection with this matter, and which unfortunately adds considerably to its danger, is the insidious nature of this electrolytic action. The existence of any injury will, in all probability, not be apparent until a whole length of main is completely destroyed.

The possibilities of gas for heating and cooking are almost unlimited; and I believe the time is not far distant when the present wasteful domestic coal-fires will be superseded by improved gas cooking and heating stoves. To maintain our position, we must take care to use the best, and therefore the most economical, apparatus, and adopt the most efficient methods of manufacture. If we do this judiciously, we shall, I believe, in the future extend our business even more rapidly than in the past.

But, at the risk of being misunderstood by some, and with the knowledge that I am venturing on rather delicate ground, I must say a few words upon one aspect of this matter that has forced itself upon me for some time past. I refer to the unprofitable expenditure which is sometimes incurred by the substitution of modern apparatus for what may, indeed, be rather antiquated, but is nevertheless still capable of being economically worked. When new plant is required, by all means let us choose the very best that we can obtain; but it does not necessarily follow that it is always good policy to discard old plant because better has been devised. Due consideration is not always given to this by gas engineers. In our anxiety to make cheaper gas, it is so easy to be persuaded by makers of improved apparatus that the adoption of their particular speciality will effect great economy. It is, however, quite another thing to obtain this in actual working, when due allowance is made for the real cost of the substitution of the new plant for the old.

I have taken some pains to investigate from this standpoint, as far as I have had the opportunity, the statistics of various gas-works; and I notice some curious facts. It would, of course, be impossible for me to go into much detail, or to say anything that could be taken to apply to any particular works. I may, however, state that I know of works where old plant has been discarded, and which now claim to have the most up-to-date carbonizing arrangements; yet in spite of this, judging from the published results, they are not working as economically as others in which the retort-house arrangements are said to be almost prehistoric. This is, I believe, mainly because in the former instances the new capital expenditure has been out of all proportion to the saving effected by the change.

In the case of a works with nothing but old-fashioned plant, it will certainly pay to displace a portion of this by modern apparatus; but it will just as certainly not be sound policy to erect (say) expensive retort-settings in place of others which are doing fairly well, when these retorts for many years to come can only be used for a few weeks in the winter. Yet I know works in which such a wholesale reconstruction has been carried out, and some where the plant will most likely be quite out of date long before it has been possible to work it for half the length of time over which the capital cost of the alterations will be spread. Who among us does not know of gas-works (of course, not his own) in which the erection of improved apparatus has failed to come up to expectations?

Even when new plant does all that has been claimed for it, there are usually many items of increased expenditure contingent upon any fresh system of working, not the least of which is the disturbance of the conditions of labour on the works. In any re-arrangement, the workmen usually obtain a considerable portion of the benefit accruing; and who shall blame them for trying to get as much remuneration as they can?

Again, while it is very desirable that extensions should be made in sufficient time for a manager to easily cope with the increasing demand for gas, I think sometimes we look rather too far ahead, and commit ourselves to the adoption of a particular system of working for many years; whereas, if only the really necessary extensions are made, then, when more plant is wanted, we shall probably find that we can adopt further improvements. In Bradford, I have been handicapped by retort benches and fittings having been erected fifteen years before they were really necessary. Many of the hydraulic mains and fittings were even sold for scrap after one season's working.

Another matter which does not always receive its proper share of attention from gas engineers and managers is the painting and preservation of ironwork, and especially of gasholders. When we consider the enormous capital expenditure upon holders alone, and how easily their durability is shortened by neglect, or can be very considerably extended by careful treatment, we must feel surprised that such an important matter should be overlooked. At our four gas manufacturing stations we have altogether thirteen holders, seven of these having three lifts. For many years we have been troubled by the persistent appearance of rust on some of the sheets; and as any serious rusting, allowed to continue, would soon involve re-sheeting, I have taken some pains to discover the best means of preventing further corrosion. I have frequently both seen and heard it stated that it is impossible to stop rusting on exposed iron or steel plates after it has once made headway. Although I do not agree with this statement, I admit that the problem is a very difficult one; so that, in this matter, as in many others, "prevention is better than cure."

Our present holders, none of which has ever been re-sheeted, vary in age from 14 to 49 years, and, as far as I have been able to ascertain, have been painted or coated with tar or tar varnish every summer. It is a curious fact that the holder which was erected 49 years ago is now in much better condition than others which are only 25 years old. This is no doubt owing partly to the superior quality of the iron used fifty years ago—the sheets having been made of the celebrated Bowling iron—and partly to the fact that the holder was probably well painted with red lead when new. I have found that steel gasholder sheets have a greater

tendency to rust than iron; and hence the necessity for more careful painting, now that the use of steel is so general.

I am satisfied that the chief causes of corrosion in the case of our holders have been: First, want of proper care in painting when the holders were erected; and, secondly, painting in early years with ordinary unboiled tar, which always retains some ammoniacal liquor. Rusting has gone on underneath successive layers of tar year by year, and has only become apparent when considerable mischief has been done. To deal with the rusty patches, I have tried every plan of scouring and preliminary treatment and almost every kind of ordinary and so-called anti-corrosive paint that I have heard of, but have found nearly all to be utterly useless for the purpose. As a result of numerous experiments, we have now adopted the plan of first thoroughly and carefully cleaning off the rust with small wire brushes, and then immediately afterwards painting with red lead freshly mixed with the best boiled linseed oil. It is important that the red lead and oil should be properly incorporated by grinding, and that the paint should be used up within two or three hours of its preparation. This paint hardens in a day or two. We then give the patches a coat of a special enamel paint, which we have selected as being the most suitable from among the many we have tried. After this has hardened, it receives a third coating of prepared tar varnish.

I need hardly remind you that fine, dry weather is absolutely necessary for this work, and that every trace of moisture must be rigorously excluded. This treatment, when properly carried out, has so far effectually prevented any further corrosion. In other trials, we have found that even the most careful scouring, followed by three coats of red lead paint and one of prepared tar, has proved a failure; the rust reappearing in two or three months' time.

New ironwork should be painted with red lead, or at least with boiled oil, before any rust has had time to form; but I am afraid that this is rarely done. The rusty places are merely painted over, with little or no attempt at scouring, as if they were of no account. Corrosion then goes on underneath, and the paint in a short time peels off; the iron being thus exposed until the next painting season comes round.

When visiting other gas-works, I have taken particular notice of the condition of the ironwork; and I have been struck by the slight importance which some managers appear to attach to this question. Last autumn I saw a gasholder in use which, during the summer, had been re-sheeted, and had then been at work again for six or seven weeks. When I saw the holder, only the rivets and joints had been painted, and at least one-third of the surface of the new sheets was already covered with rust. I was informed that the holder would be tarred when they had men to spare for the work. In another works I saw a holder which, I was told, could not be completely filled in the summer, because when it became about three-fourths full, the leakage from it was equal to the make of gas at that time of the year.

The use of prepayment meters has extended considerably; and the sales through these meters now form a large proportion of the business of many gas companies. The system seems to be popular, and is no doubt the most satisfactory means of persuading many people to use gas for the first time. I am afraid, nevertheless, that some managers, who at present find the supply of gas through prepayment meters very profitable, may discover in a few years that these consumers will object to pay the extra price which is necessary to cover the additional cost of supplying gas in this manner.

In Bradford, we are fortunate in having in operation a much better system, although we are told sometimes that we are behind the times, by people whose interests are not exactly along the same lines as those of the community. For upwards of forty years, it has been the invariable custom in the town for gas-fittings to be put into all new houses and cottages as a matter of course. A builder would almost as soon think of leaving out the doors or windows, as of omitting the gas pipes and meter. Tenants would not take a cottage in Bradford unless it had a supply of gas. All owners of cottages are responsible to the Corporation for the gas consumed; and they collect a sufficient sum weekly (3d., 4d., 6d., or 9d.) from the tenant with the rent, and generally have to allow a slight rebate at the end of the half year, according to the actual quantity of gas used. We allow varying discounts for large quantities of gas consumed; and all the property of each landlord is grouped in one account.

In this way, the collection of our small accounts, including bad debts, costs the Corporation less, I believe, than is the case in any other town. This arrangement works very well indeed, and satisfies everybody except a few agents and owners of the worst class of property, who sometimes find it difficult to collect even the rent. It would be useless to try to introduce such a plan into any other town at the present time; but in Bradford everyone has been educated up to it, and takes it as a matter of course.

The population of our district is 219,000; and we have 55,200 consumers—being one to every four inhabitants. The amount of gas used per head of the population last year was 7848 cubic feet. In the whole district—not counting farmhouses and cottages situated some distance from any road—there are only seven houses of a weekly rental above 4s. in which gas is not used.

There is little to be said at present upon the subject of expensive coal. We have ample evidence that prices are falling, and will continue to do so; and that, in their exorbitant demands of last year, the coalowners have over-reached themselves. Unless I am very much mistaken, the consequences of their folly will be brought home to them severely during the next two or three years. Many of us will derive some satisfaction from the fact that several of the onerous contract conditions which the coalowners forced upon us last year are likely to turn out to their disadvantage instead of ours.

The high price of coal has enabled most gas managers to realize proportionately higher prices for coke. In some works, the policy of selling surplus coke outside the town at absurdly low rates has lately been adopted. This is a practice which seems to be growing, but is unjust to surrounding works, and is one which should be strongly condemned. To me it seems most unfair for a gas-works to send its surplus coke into neighbouring towns at such prices that it can be sold there at less than the local gas companies can fairly charge, or even at less than the retail prices at the works at which it was produced.

We have heard a good deal lately about cheap producer gas and its economical distribution over extended areas; but I fail to perceive much chance of its proving a serious competitor, seeing that its calorific value is only one-fourth that of coal gas, and that therefore more gas and larger engines will be necessary.

Some people seem to be anxious about the possible presence of arsenic in coke. We have carefully tested coke made from various kinds of coal; but although traces of arsenic have been found in a few instances, the quantity is so infinitesimal as to be quite unimportant.

In conclusion, I am afraid that I shall have exhausted your patience; but I hope that at least some of the matters to which I have drawn your attention may have interested you, and suggested points for future discussion.

Arsenic in Coke and Other Topics.

Mr. W. W. Hutchinson proposed a vote of thanks to the President for his masterly and comprehensive address.

Mr. H. Townsend (Wakefield) had pleasure in seconding the proposition. As an old colleague of Mr. Wood's, it afforded him pleasure to see him occupying the position of President. In his address, Mr. Wood had given them many facts that he (Mr. Townsend) had not seen in print before; and among them a matter he should like to remark upon. It was the question of arsenic in coke, which was rather a serious one at the present moment. Coke had been, until this year, largely used for the making of malt; but at the present moment, owing to the scare of arsenic in beer, the brewers had practically tabooed gas-works coke. A Royal Commission was now sitting in London to investigate this question of arsenic in beer; and it had been stated in evidence by the City Analyst of Manchester that arsenic also existed in malt, and that it was derived from the roasting of the malt by means of coke or anthracite. Now the brewers allowed the use of anthracite, but tabooed the use of gas-works coke. He thought the interests of the gas industry made it very unwise on their own part to ignore the Commission; and he considered their interests ought to be represented. The Analyst referred to stated in his evidence that the amount of arsenic present in coke was infinitesimal; and the Analyst of the City of Liverpool, who gave evidence at a Coroner's inquest the other day, had also stated that the amount of arsenic present in coke was not sufficient to do any detriment to anyone. Arsenic would be found in almost any fuel if it was closely enough analyzed. It was found in almost all anthracites, and in almost all foundry cokes. He therefore thought the gas industry ought not to lose sight of their own interests, but should see that the Commission that was now sitting left the question in a satisfactory state.

Mr. Thomas Newbigging said he should like to support the resolution. He thought it needed a good deal of courage on the part of the President to touch in the way he had done on several points. He thought, for example, it required considerable courage to refer as he had done to the unprofitable expenditure that was sometimes incurred by the substitution of modern apparatus for what might be now rather antiquated, but was nevertheless still capable of being economically worked. If any member had any difficulty about a subject to introduce to one of the meetings, he (Mr. Newbigging) would recommend him to take up this identical subject, and read a paper on "The Disadvantages of Modern Plant in Gas-Works." (Laughter.) He ventured to say they would have an excellent and informing discussion. During the past fortnight, they had had two remarkable Presidental Addresses. He alluded, of course, to the one they had heard that day; and the other (which he hoped the members had all read) was that of Mr. Thomas Glover, of West Bromwich, and which, in his opinion, was an able and luminous forecast of the future. It was very pleasant indeed to see the younger members of the profession equalling, if they did not excel, the veterans of the past days.

The motion was carried by acclamation.

The President gave expression to the pleasure which the kind words he had heard, and the hearty manner in which the vote was carried, had given him. Among other observations, he said he had been especially interested in the subject of arsenic in coke; and he would have gone perhaps into it with rather more detail, but he thought it was hardly desirable upon the present occasion to introduce matters that ought to be the subject of some controversy. He fully agreed, and he thought they all did, with the remarks of Mr. Townsend. They ought to make a stand against an injury being done to the coke trade through false representation as to the amount of arsenic in the coke. They had heard the most ridiculous statements on the subject. He had himself been

shown a sample of gas coke (not made in Bradford) which was said to contain 7 grains of arsenic per pound. As perhaps the members would have gathered from his observations, they had at Bradford gone into the matter very carefully; they having a very good chemist. The maximum amount of arsenic they had found in any coke had been very small quantities indeed—something considerably under $\frac{1}{10}$ grain per pound, which was a different thing to 7 grains. He was much obliged to Mr. Newbigging for the kind way he had referred to the address, especially with regard to what he was pleased to call his "courage" in speaking of unprofitable expenditure on new works. He (the President) specially used the word unprofitable, because he should not like anyone for a moment to think he was advocating the carrying on of old plant which would be unprofitable. He was quite sure that almost all the members knew of instances where there had been unprofitable expenditure upon modernizing a gas-works; and it was especially to that portion of capital expenditure, and only to that, he wished to refer. Concluding his remarks, he proposed a vote of thanks to the retiring President, who, he said, had had a most successful year.

Mr. RITSON made a suitable response.

Mr. R. HOOTON (Ashton-under-Lyne) then read a short paper on

THE ENRICHMENT OF COAL GAS.

Perhaps a little explanation at the outset, as to the cause which prompted me to open this discussion on "The Enriching of Coal Gas," may be of interest to some, if not all, of the members present. I will be as brief as possible, so that the greatest amount of benefit, arising from the discussion, may be obtained.

The standard illuminating power for Ashton-under-Lyne is 16 candles. My Directors, however, instruct me to supply the town with good gas; and I might say we try to keep it as near 19 candles as possible. This, however, I find I cannot always do, owing to the irregular delivery of cannel, which is the only means I have of enriching; for frequently, when most required (say, in the depth of winter), I cannot obtain full supplies of cannel, and this, occurring very often when I am in most urgent need, has altogether upset our usual illuminating power and also our make of gas per ton.

I might say, apart from the cost of stacking, I have not sufficient room to store any large quantities of cannel, even if it was desirable to do so. Therefore, I feel the necessity of having at hand some other method of enrichment, which will enable me to tide over the difficulties I have experienced, in the irregularities of the supply of cannel, even though it may not be sufficiently economical to supersede the use of cannel altogether.

My purpose to-day in introducing this subject is to elicit from those of our members who have had experience in enriching in other ways than by the use of cannel, some particulars as to the best and most economical means of attaining my purpose. Believing that the information will be of benefit to the whole of the members, I feel perfectly justified in asking for it; and I will do so in the form of questions. Let me preface them by saying, in selecting the apparatus for the enriching of coal gas, I shall give preference to the one most compact, simple in construction, and requiring a minimum amount of attention.

My questions are—

(1) In the enriching process by benzol, is the gas produced an absolutely fixed gas—say, up to one or two miles from the station—or is it at all likely to condense back again?

(2) Has there ever been found any distinct traces of the benzol in syphons in outlying districts?

(3) Can any member say whether enriching by benzol affects the sulphur compounds to any degree, and to what extent? This would, of course, vary according to the quality of the benzol.

(4) Can the candle power be regulated to any certainty in a large works by the benzol method; and how would such a result be obtained if the carburettor was put on the outlet to the town.

(5) Has any member had any experience with both carburine and benzol, as regards cost, enriching value, and their carrying properties?

(6) Is it practical to enrich on the inlet to the station meter, and could the apparatus be fixed in front, or in close proximity, without fear of any of the hydrocarbons being deposited to any great extent? Would it interfere with the mechanism of the meter, because, if so, there would appear to be some difficulty in adopting the process, as two of my holders are at the works, and another two at a distance of something like a mile away, with different connections and governors?

This is a subject of such great importance to the gas profession, that I appeal to all members with experience in enriching by oils to let the less fortunate ones have their opinion on the matter.

In conclusion, I may give the following figures relating to

Benzol Enrichment at Southport during the Fortnight ending Nov. 8, 1900.

Gas made	19,218,000 cubic feet.
Benzol used	4429 gallons.
" " per 1000 cubic feet made	0·219 gallon.
Cost of benzol per 1000 cubic feet of gas made	2·18d.
Cost per 1000 cubic feet per candle enrichment	0·42d.
Total candle enrichment	5·15.

Discussion.

The PRESIDENT said they were indebted to Mr. Hooton for bringing before their notice this very important question, though perhaps in the minds of some the necessity for enriching their gas was not quite so great as it was a few years ago, before the introduction of incandescent gas-burners. Almost all the members were competent to say something on this question; but he should first like to hear Mr. Wilfrid Irwin, who had been invited to be present by their late President. He was a gentleman who had largely interested himself in this subject; and they would all be pleased to hear what he had to say.

Mr. WILFRID IRWIN said this matter was first brought to his attention some 16 or 18 years ago. At that time, he was connected with the tar trade; and the price of benzol had risen to a very high figure—about 15s. a gallon. So that the firm with which he was connected turned their attention to other means than the distillation of tar whereby to obtain this substance. They then began to make experiments on gas itself, and discovered that, from Manchester gas, they could obtain about 3 gallons of benzol per ton of coal carbonized, or per 10,000 cubic feet of gas. After making these experiments on the extraction of benzol from gas, they ultimately erected plant for the purpose. They bought the Manchester gas, which was then sold at about 2s. 6d. or 2s. 9d. per 1000 cubic feet, and extracted the benzol, and did what they could with the remaining gas. He examined its properties, and found that, after extracting the benzol, it was quite unfit for illuminating purposes. All they could do with it was to burn it under the boilers. It paid at the time to do this; but, of course, it did not last long, because the price of the product soon fell. At the same time, it gave them experience in the extraction of benzol from gas, which they did by means of oil. After a long series of experiments, they found another way of working their process—by erecting gas-works for the production of the gas themselves from which to extract the benzol. Of the total benzol produced in gas at the time of carbonizing, only about one-tenth, or perhaps not more than one-twentieth, would fall out in the tar. The rest remained in the gas; and it was chiefly to this that its illuminating power was due. Then came the question, Could they extract the benzol from the gas, sell the benzol, and re-carburet the gas with something else? He began to make experiments on the enrichment of gas by means of carburine. This was an idea that he thought would turn out very successfully before completing the experiment. He soon found, however, that the enriching power of carburine was only one-third that of benzol; and the amount they could get into the gas was much less in proportion to what would be found in the case of benzol. Therefore the idea fell to the ground. This was where the matter stood for several years, until within about five years ago, when the price of benzol itself came down so low as to bring it within the compass of gas companies themselves. He then began to advocate the use of benzol by gas engineers; and in one or two cases, he got it introduced. The price came down to about 1s. 1d. to 1s. 3d. some four or five years ago. As soon as it began to be used for gas enrichment, it jumped up to about 4s. or 5s. A demand being again produced for benzol, stimulated the erection of coke-ovens under the Simon-Carvès, Semet-Solvay, and Otto systems, by which benzol could be produced in large quantities from coal in the process of coking—the process of coking in the ordinary way to produce hard coke, not gas coke. The erection of these ovens in Germany, and also to a large extent in this country, brought down the price again to where it formerly was, or less—about 6d. per gallon; and in spite of the amount that was going into use as an enricher, the price was still keeping tolerably low. It was now about 10d. to 11d. per gallon; and if it were not for the employment of benzol for other purposes than aniline making, for which it was at first exclusively, or almost exclusively, used, the price would be now just the cost of extraction from gas, which would be somewhere about 6d. per gallon. If it got below this price, the owners of coke-ovens would cease to extract it, because it would not pay them to do so. But seeing that it was to the benzol that the gas owed, or very largely owed, its illuminating power in the ordinary way, it was consequently the best substance to use for its enrichment. This he thought everybody would bear out was the case with gas produced at high carbonizing temperatures: That there was always a certain amount of vapour of naphthalene carried with the gas that it was absolutely impossible to prevent under ordinary circumstances; and if such gas were enriched with benzol, there could be no, or practically no, deposition in the mains. If the temperature at which the gas was produced was not quite so high, then it owed its illuminating power to substances which had high boiling-points, and which would deposit to a slight extent in the mains. If benzol were added before condensation in the gas-works, there could be no further deposition in the mains; if added after condensation in the gas-works, then for every 100 gallons added, possibly 1 gallon might be found to condense in the mains. He did not think there would be any more than that. Anyway, this was the answer he had to give to Mr. Hooton. Another matter the author had referred to was the question of sulphur. Coal tar benzol contained enough sulphur to increase the amount of sulphur in the gas several grains per 100 cubic feet, if used in a state without any special rectification. Supposing they added 1 gallon to 10,000 cubic feet, he could easily imagine it would increase the amount of sulphur perhaps by 6 grains per 100 feet. If it were specially purified (as all benzol that was to be used for gas enrichment ought to be), then it need not increase the sulphur in gas more than 2 or 3 grains. As to the amount of enrichment

obtained (say) per gallon of oil per ton of coal, that was an extremely difficult question to answer straight away. It bore so much upon the gas to start with. If it was a poor gas, the enrichment was so much greater than with a rich gas. With 17 or 18 candle gas, they would get, with an argand burner, probably 1½ candles per gallon of benzol per 10,000 cubic feet; with 16-candle gas, they would get more than that; with 20-candle gas not so much. In cases, however, where the ordinary union-jet burner was used, they would get double this additional illuminating power, and this was one of the advantages of using benzol—that the additional illuminating power obtained with the ordinary burners used was much greater than with the testing-burner at the gas-works. He was regarding it now solely from the consumers' point of view and not the gas managers. Respecting the price in the future, he thought that, in all probability, there would be such a supply of benzol from coke-ovens as to keep it at somewhere about its present price—a little short of, or over, 1s. a gallon. This might be expected to be the price for some time to come. He did not see why benzol should not be used on the Continent in connection with water gas. He had not heard of it being used to any extent in this country in that direction; but he believed that some gas engineers were contemplating using it. If they did, he should like to hear from them. His experience had only been on a laboratory scale; and he could not therefore give any practical experience on the subject.

Mr. JOHN CHEW (Blackpool) said he would try to answer one or two of the questions Mr. Hooton had put. He (Mr. Chew) started the use of benzol some seven or eight months ago; and he had continued it up to the present time. His object in using benzol in the first instance was to try to get rid of the naphthalene bogie; and since he began to use it—at any rate, for the last four or five months—he had not had ten cases of stoppages. The first question the author put was as to whether the benzol carried to the extreme limit of the district. His (Mr. Chew's) method of using the benzol (and it was one that could be judged by those who had practical experience), was to put it in as the gas went into the town's mains during the lighting hours of the evening—not in the hours of daylight or after midnight. This way of using it economized the benzol. The illuminating power of the coal gas was raised in his case about 1½ candles, as a rule, depending in great measure on the kind of coal in use on the particular day. They used from 30 to 40 gallons of benzol, and carbonized (he was using round figures) about 120 tons during the time that the 30 or 40 gallons were used. During the light portion of the day, he had latterly reduced the illuminating power of the gas, because a lower candle power gas did quite as well for heating and driving purposes. Hence it was not necessary for them to have a high illuminating power in the daytime. Some of the members had seen the apparatus he used. It did not cost much; and the main part of the outlay was spent in the storage for the benzol. There had been no deposits in the apparatus, nor in the mains, so far as he was aware. He had not tested the illuminating power of the gas to see whether it carried to the extreme end of the district; but he had contemplated doing so. Mr. Hooton asked whether the benzol could be admitted in close proximity to the station-meter. If it was, it would have to go to the gasholder, and stand there. As he had said, he found it best to put the benzol in just as the gas was passing into the town during the lighting hours—leaving the poorer gas for use during daylight. This resulted in a saving of cannel. He had heen in the habit of using 20 per cent. of cannel; but he was not using more than 6 per cent. now, with the 30 to 40 gallons of benzol to (say) 120 tons of coal.

Mr. SAMUEL GLOVER (St. Helens) said he had taken some little interest in this subject of enrichment for some time past; and having had an oil-gas plant at work in connection with the St. Helens Gas-Works for five or six years, and having been interested also in looking at the problem generally, he had been much interested in the remarks made about the effect of benzol on naphthalene, and the cost of enrichment by benzol. He considered the conditions influencing enrichment were very diversified indeed, and no person could lay down a law that would suit everyone else's conditions. It was absolutely necessary, before one could say which would be the best system under various circumstances, that a trial of the enrichers now in the market should be undertaken. The results depended upon many things—the nature of the coal carbonized; the gas made from it; and, as Mr. Irwin had said, the temperature at which the coal was carbonized had also something to do with it. He thought they all sympathized with Mr. Hooton, and could congratulate him on the fact that he might soon be out of his difficulties, which were by no means insurmountable. But he would need to have more than one string to his bow. In these days, when there were several improved methods of enrichment, it was incumbent upon those who had to deliver a regular quality of gas to have more than one string to their bow. And benzol would be a most useful string to have in most cases where it was found needful. Mr. Hooton asked as to the gas being fixed. The vapour of benzol was a fixed gas enough—truly not much less a fixed gas than ordinary gas; so that if Mr. Hooton made 16-candle gas, and wanted to take it up to 17 or 18 candles; the benzol enrichment was not more likely to deposit in the district than in another case where 18 or 19 candle gas was made in a less satisfactory way. The benzol would not be deposited (as Mr. Chew said his experience confirmed) when the benzol was properly mixed with the gas. The candle power, too, could be simply regulated by turning the benzol into the gas as it was going out; but it was so ready at hand, that it was necessary to watch it. He had heard a gas engineer (who had adopted the benzol enriching process as a cure for all the ills to which he had been subjected) say it was the easiest thing in the world to lose £1000 over it. It just wanted to be gently applied to the gas on the outlet to the town. The purity of the benzol was another very important thing. To use benzol which would add sulphur compounds to the gas was a serious objection to its employment. He knew there were engineers who had used benzol, and had found their sulphur compounds go up very considerably immediately after. They should aim at reducing sulphur compounds as much as possible, and not add to them. It might be advantageous under some circumstances and conditions to add the benzol enrichment before the station-meter; and Mr. Hooton need have no fear that the added benzol would have any effect upon the drum of the meter. Their meters in these days would stand a little more benzol in the gas without "melting" down. With regard to the extraction of benzol from coal gas—whether from coke-ovens or elsewhere—that had been working now for a considerable length of time; and it was owing to that, that benzol was with them as an enriching agent at all. He thought they ought always to remember that coal gas was about the easiest gas made to enrich, and was much more easily enriched with benzol than water gas, for instance, would be. Knowing that Mr. Hooton was going to bring up this subject, he (Mr. Glover) extracted part of a lecture which was delivered by Professor Lewes before the Institution of Gas Engineers last May, where he spoke of methods of enriching, and of the admixture of benzolized water gas with coal gas. Professor Lewes said: "When water gas is benzolized before admixture with coal gas, if the candle power is taken it is found to be only about 9 candles. Yet the addition of from 17 to 20 per cent. of this to the coal gas having a value of 16 candles will yield a mixture of over 17-candle power." Now this seemed a very surprising conclusion and result—to mix two gases of such an illuminating power and get by such admixture a higher illuminating power. It must arise from the fact of the mixing developing all the light-giving power of the constituents of one or both of the mixed gases. Then Professor Lewes went on: "The methane in the coal gas having brought out the illuminating value of the benzol in the water gas. It has been more than once suggested that a town supply of water gas carburetted with benzol might be sent out without admixture with coal gas; but this would require so much benzol that a carburetted water gas . . . would be much more economical, as the oil gas used in this case to limit the water gas contains sufficient methane to bring out the illuminating power of the unsaturated hydrocarbons present." Then Professor Lewes proceeded to say: "The flame of coal gas enriched by carburetted water gas is shorter and brighter than a flame of the same lighting power of coal gas alone." This threw a little light upon the effect of enrichers upon the size of the flame in the same burner, and had some reference also to the different light-giving power or light-giving efficiency of gases of lower power, because to get the same illuminating effect a larger quantity of the lower illuminating gas had to be used; and they got a larger flame, and therefore more radiating surface on the flame. This was one advantage that coal-gas heated incandescent mantles had over a glow lamp of the same illuminating power, inasmuch as the electric glow lamp had so small an area of total surface that its lighting efficiency (though at the photometer it might be shown as of 16-candle power) was not so valuable in distributed light as the 16-candle power beautifully heated incandescent gas-mantle. Professor Lewes said: "I was unable to detect any difference in the height of the two flames of equal illuminating value—one flame,being the undiluted coal gas, and the other coal gas and benzolized water gas." This effect of different admixtures of gas threw light upon some experiments he (Mr. Glover) conducted for another purpose some few years ago with regard to the use of cannel. He formerly used cannel along with coal; and he found this was a most extravagant method of employing cannel, as it did not bring out in the coal gas the best enriching value of the products of the cannel when carbonized. The composition of the coal and cannel differed so much that they needed to be carbonized at entirely different temperatures to bring out their light-giving value. Therefore cannel carbonized along with coal, and at the same temperature, did not serve the purpose of enriching so much as when it was carbonized in separate retorts, and kept from admixture with the coal gas until the latter had been thoroughly condensed, and the tar removed from it, and then mixed with the cannel gas produced at some temperature suitable to its composition. Very likely in this case also, the methane had something to do with the light-giving power being raised. In these days of incandescent gas lighting (which the President had so fully referred to in his address), he (Mr. Glover) thought they ought, as gas engineers, to look at the enriching of their gas as much with regard to its heat-giving value as to its light-giving power. As more and more gas was being used for heating generally—in gas-engines, stoves, and incandescent gas-burners—they ought to use the enricher which should serve the particular purpose aimed at at the particular time. He had tried experiments with gasoline and benzoline; and although the enriching effect, so far as the illuminating power of both was concerned, was equal when equal quantities were used, the heat-giving value of the gasoline was about three times higher than that of the benzoline enrichment. There was another point to which he should like to refer, and that was the enriching of gas by means of better purification—removing from the gas all the carbonic acid. He thought this was

(he used the words advisedly) one method of enriching their gas, by removing from it the carbonic acid which diluted the gas so much, and which considerably hindered its heating and explosive and lighting power. The whole subject, he thought, reminded them of what a favourable condition their President was in in having a skilled chemist on his works; and it confirmed in his (Mr. Glover's) mind the idea he had held for some time, that, as gas engineers, it was encumbent upon them to recognize that there was a great deal more to be found out for their own benefit as well as for the public at large, by bringing more skill to bear upon the subject of the analysis of coal gas, the effect upon this coal gas of various enrichers in regard to its purity, its light-giving power, its heat-giving power, and its permanency. He should like to refer Mr. Hooton to the paper on "The Enrichment of Coal Gas" read in 1894 before the Institution of Gas Engineers, by Mr. Ferguson Bell, in which he went into the subject of the cost of cannel enrichment, high-power water gas, and oil gas made by two different processes (mentioning in particular the Peebles oil gas), carburetting with petroleum spirit, carburine, naphtha, and 90 per cent. benzol, all of which would be found in the published "Transactions" of the Institution. Since he adopted Peebles oil gas, he had not found anything come up to it. It had been most successful for five years, and nothing beat it in price, except low temperature carbonization. The oil-gas process had given him the utmost satisfaction; and it enabled them readily, by varying the number of retorts, to make more or less gas. It was easily manipulated; and it enabled them to regulate the illuminating power. By adding 1 per cent. of oil gas, they could raise the illuminating power 1 candle.

Mr. J. H. Brearley (Longwood) stated that he had tried various forms of enrichers, but was now using benzol in the Maxim-Clark carburettor. It was originally put in for carburine; but they had afterwards turned to benzol. The enricher was put on every evening; and the enriching continued during lighting hours, as in Mr. Chew's case. He had been working out what the cost was for this form of enricher. Taking the cost of the benzol at about 10d. per gallon, and the quantity Mr. Chew used at between 30 and 40 gallons—to be exact, take 35 gallons at 10d., that made about 30s. This Mr. Chew stated was sufficient to enrich the gas from about 120 tons of coal; so that providing for the enrichment of the (say) 1,200,000 cubic feet of gas necessary for lighting purposes was less than ¼d. per 1½ candles per 1000 cubic feet. In his own case, the carburettor was fixed so that it would deal with the gas as it passed into the district; and its use was at times invaluable. They had anti-dip pipes fixed; and sometimes the engine-man was not quite so smart as he should be. If he happened to get the gas at such an illuminating power that bad consequences might ensue, they found the benzol invaluable. Such a thing was not likely to occur very often, but it was liable to occur where they had anti-dips. He was personally indebted to Mr. Irwin for one thing, and that was the statement in regard to the difference between the argand burner and the jet. Always, when he (Mr. Brearley) had tested the gas when the benzol enricher was at work, he found the bar-photometer never gave the increase in illuminating power that the jet did. Mr. Irwin had elucidated the difficulty he (Mr. Brearley) had experienced. He was not an expert chemist, but this explained the one point with which he had had some difficulty.

Mr. H. Kendrick (Stretford) said he was one of those who only used cannel for enrichment. But they had been fortunate in buying cannel at a cheap price; and it cost them less for coal and cannel at the present time than it would do if they bought coal only. So that, under present circumstances, he should certainly not want or care to change the enrichment for either the one Mr. Glover had (the oil gas enrichment) or the benzol enrichment. They found that the coal and cannel together was costing about 17d. per 1000 cubic feet; whereas if they bought coal only, it would cost them 1d. per 1000 cubic feet more. So that they were getting a decided advantage by using the mixture of coal and cannel. They bought practically all second-class cannels, and were using 60 per cent.

Mr. T. N. Ritson (Kendal) remarked that the question of the kind of burner to be employed in the testing of enriched gas from benzol was a very important one. Mr. Stenhouse had taken great interest in it, and had made some tests upon Manchester gas. With Manchester gas before enrichment, he found the union jet gave an illuminating power of 12·6 candles, and an argand (so arranged as to give the most light) 21 candles approximately. The benzol added, or rather contained in the enriched gas per 10,000 cubic feet, was 0·075 and 0·079 grammes per litre with the respective burners. The illuminating power after enrichment was 28·6 candles with the union jet, and 23·5 candles with the argand. These showed gains in luminosity by enrichment of 16 candles and 2·5 candles respectively. The gain in candle power per gallon per 10,000 cubic feet (the average of three tests) was 2·7 candles and ½ candle. It would therefore be observed that the burner used had a wonderful effect upon the results. From this it would appear that the argand burner did not show the actual enrichment of a high quality gas, but that the enrichment value was most appreciable with the union jet—the burner most generally used by the public. The question arose whether they should not extract from their coal (say) 11,000 or 12,000 cubic feet of gas, and enrich up with the benzol, because it was a well-known fact that, the lower the illuminating power of the coal gas, the greater the amount of benzol that would be taken up—they got a better enriching effect with low-grade gas than with high-grade gas, as Mr. Irwin pointed out in his remarks. Another very important point which would no doubt be of benefit to gas authorities, was that benzol was more or less a drug upon the market; and if they could use it for enriching purposes then up would go the price of tar, and so they would enhance the value of one of their principal bye-products. In using benzol, it was also very necessary that the gas manager should see that what he got was almost free from sulphur compounds; otherwise it might have a very disastrous effect upon the quality of the gas if he sent out such sulphur compounds as thiophene, carbon bisulphide, and alliol, which existed in the first runnings of the benzol. But unless they were careful with the people from whom they bought the stuff, they would get into serious trouble. Therefore he would advise gas managers to get a guarantee from the manufacturer to the effect that the benzol was free from these sulphur impurities. Mr. Glover had raised another point which he (Mr. Ritson) foreshadowed in his address last year, and that was the extraction of the carbonic acid from the gas. He was sure a great deal more could be done with their ammoniacal liquor if they went the right way to work; and if they only looked round the corners, something would be done yet. He would strongly recommend anyone who was interested in the subject to go to Halifax, and see what Mr. Holgate was doing there. He had achieved marvellous results with the simplest process; and he (Mr. Ritson) was going to try to get it started at Kendal. He (Mr. Ritson) had a carburetting plant, and had used both carburine and benzol; and certainly he gave preference to benzol.

Mr. R. Surtees (Fenton) said that, in his case, he was unfortunately Manager of a works where they had only one gasholder; and consequently, no matter what quality of gas was being made, it had to go into the town. That was the state of things he had to face; and he succeeded in bringing his Committee to the conclusion that an enricher must be fixed to overcome the difficulty. They visited several works where he knew that enrichers were in use; and from the statements made to him by several managers, his Committee were led to the adoption of the Maxim-Clark carburettor. He had only had it at work since the previous Wednesday; otherwise he would have been pleased to have brought forward some statistics. At any rate, he had had it in use sufficiently long to prove to him that it would be a great aid in sending out gas of decent illuminating power and quicker than could be done with cannel

Mr. Hooton said he was delighted with the success of his first attempt at a paper. The discussion had been very interesting and instructive to him. Mr. Irwin had touched upon a point with reference to the bar photometer and the jet which was very useful; and he (Mr. Hooton) was personally obliged to Mr. Chew for his remarks. But he might say that he was not troubled with naphthalene; so that was not one of his bugbears. He was also indebted to Mr. Glover for the way he had handled this question; as well as to Mr. Brearley, the Past-President, and Mr. Surtees. With him (the speaker) it was not a matter altogether of £ *s. d.*; but the enricher he adopted must be something very effective. He reminded the members of the time when enrichers would not be required—when they would supply just such quality of gas as could be produced from the coal nearest to the district in which they were located. This might be all right in the South, where there was flat, level country; but they were not all situated in level places. He thought perhaps he was better situated than the majority of the members, but he should have his doubts about supplying a gas of low candle power, without the mains were of the full capacity for the streets, and the services thoroughly cleaned. At the same time, he hoped the day was not far distant when they would be able, as gas managers, to do without the use of enrichers altogether.

Votes of Thanks.

On the proposition of Mr. J. Chew, seconded by Mr. J. S. Naylor, a hearty vote of thanks was passed to the officers for their services in the past year.

Proposed by Mr. Ritson, and seconded by Mr. Harrison Veevers, a similar compliment was then paid to Mr. Hooton for having introduced the subject for discussion, which had proved of so interesting a character.

On the invitation of the Committee, the members subsequently had "high tea" together.

Southern District Association of Gas Engineers and Managers.—We learn from the circular issued by the Hon. Secretary of the Association (Mr. J. W. Helps, of Croydon) that the annual meeting will be held at the Holborn Restaurant on the 14th inst. The business will include, as usual, the presentation of the report of the Committee; and, in addition, the members will be asked to consider a recommendation that the rules should be altered so as to allow of the annual general meeting being held in November, and the ordinary general meetings in March and June. The President (Mr. Corbet Woodall, M.Inst.C.E.) will deliver his Inaugural Address; and at the close of the business the members will dine together. The Association are to be congratulated on having secured Mr. Woodall as the occupant of the presidential chair for the year; and it may be hoped that his valuable assistance will be recognized by full attendances, not only on the occasion of the delivery of what cannot but be an instructive address but at the other meetings during the year.

BOSTON (U.S.A.) COKE-OVEN GAS PLANT.

Readers of the interesting series of articles which appeared in the "JOURNAL" last month, giving an account of the tour Mr. E. W. T. Richmond recently made through the United States and Canada, may remember that in the concluding article the author referred to the Otto-Hoffmann coke-ovens which he inspected at Boston. The illustrations intended to appear with this instalment of his articles had not at the time of publication been received; but they have since come to hand. It may also be remembered that at the annual meeting of the Midland Gas Managers' Association last Thursday week, the President (Mr. Thomas Glover) and subsequent speakers alluded to some such plant as foreshadowing what might be possible for a coal-carbonization-in-bulk scheme in the future. We are to-day, by Mr. Richmond's assistance, enabled to commence the publication of a very full account of the Boston plant, which appeared some time since in the pages of our American contemporary "Progressive Age," from the pen of Dr. F. Schniewind. We have already made some use of this description in the preparation of the articles which appeared in the pages of the "JOURNAL" in November, 1899 (see Vol. LXXIV., pp. 1114, 1176).

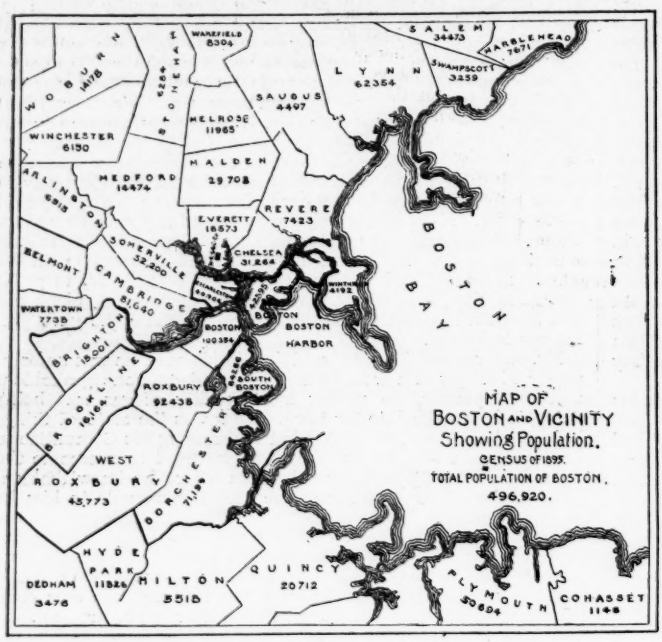


FIG. 1.—MAP OF BOSTON AND VICINITY.

This article is necessarily more or less incomplete, because the time has been too short to ascertain definitely the results of the plant. So much may be said, however, that from all indications everyone in connection with the actual operation of the plant is satisfied that all expectations from a technical point of view will be fully realized.

LOCATION OF THE WORKS.

A glance upon the map of Boston, Mass., and vicinity (fig. 1) will show that the location of the works at Everett is a most desirable one. There was no other suitable piece of property available closer to the centre of population. Ocean steamers can come directly to the Company's wharf; the coke and other products can be shipped either by water or by rail; and, finally, the distribution of the gas to the different centres of consumption does not offer any extraordinary obstacles. Thus the location may be considered a satisfactory one.

TRANSPORTATION FACILITIES.

The following means for receiving raw material and shipping products are provided:—

Wharf Facilities.—The construction of the wharf is plainly shown in fig. 4. It is 900 feet long, and it is situated on the Island End River, in which a channel has been dredged 24 feet below low-water line. This channel opens into the main channel of the Mystic River, which connects directly with the Boston Harbour. The ocean steamers carrying coal to the works pass one bridge only. On the wharf is situated a coal-bin, 432 feet long, with a capacity of about 6000 tons of coal. On this bin, three travelling coal hoists, made of steel, are provided for the unloading of the coal steamers. There is also provision made for the loading of coke into ocean steamers and other vessels, for the transferring of loaded coke cars by means of lighters, for shipping tar products in tank-boats directly from the tar-works in connection with the plant, and for shipping sulphate and other bye-products by water.

Railroad Connections.—The works are situated on the junction branch of the Boston and Albany Railroad. The New England Gas and Coke Company have their own railroad yard for coke cars, of which they own 150, specially constructed for the coke trade. Two large freight locomotives are provided for the switch work in the yard. Two roads for teams G and H, fig. 2, are provided; and a considerable number of teams have been placed in service for the distribution of coke for domestic use. The pipe-lines I of the Massachusetts Pipe-Line Gas Company are for the distribution of gas. These are two 42-inch cast-iron mains, which connect with the pipe systems of the various Boston and suburban gas-works who have made contracts for gas.

PROPERTY.

The property consists of about 288 acres of land in Everett and Chelsea. This is largely tidal marsh land, but a ridge of gravel extends from Beacham Street (fig. 2) to the point between Mystic and Island End Rivers. This gave excellent material for filling, and also for making concrete. The character of the ground necessitated a great deal of piling. There were driven a total of about 35,000 piles; and immediately upon these piles a cap of concrete was put.

The present plant of 400 ovens occupies but a small part of the property. The design of the plant permits of an increase to 1200 ovens, the erection of which number is ultimately contemplated. The next set of 400 ovens will be located between the present plant and the wharf; and the third between the present plant and the purifying-house.

COAL-HANDLING PLANT.

The coal employed is washed Cape Breton slack coal received from the Dominion Coal Company. The coal-handling plant was designed by Mr. L. J. Hirt, the Chief Engineer of the New England Gas and Coke Company, and is on the rope-haulage principle.

As previously stated, the steamers land the coal on the Company's wharf (fig. 2). On top of the 6000-ton coal-bin A, three

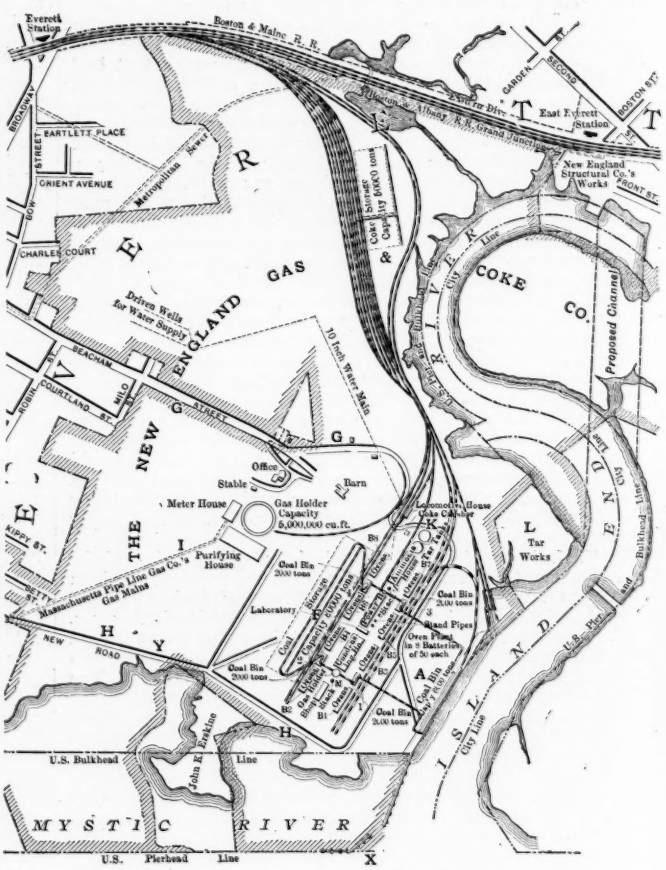


FIG. 2.—PLAN OF WORKS, NEW ENGLAND GAS AND COKE COMPANY.

hoisting towers are provided with so-called "clam-shell" grab-buckets of 1·5 tons capacity. The speed of unloading is about 150 to 200 tons per tower per hour from the full cargo. During the "trimming" of the coal, the capacity is, of course, reduced.

Underneath the bin are three tracks provided for coal lorries or cars holding about 2·5 tons each. There are thirty of these lorries. The loaded lorries run by gravity to the north end of bin A, where they are connected with the cable, which carries them to the four coal-bins, 3, 4, 2, 1 (of a capacity of 2000 tons each) at the ovens, and into the large storage yard F. The latter provides for the storage of 80,000 tons of coal, and consists of a wooden trestle from which the coal can be dumped upon the ground. From this pile a moveable double tower can pick up the coal on either side of the trestle, and transfer it back to the coal lorries, which then convey it to the oven bins.

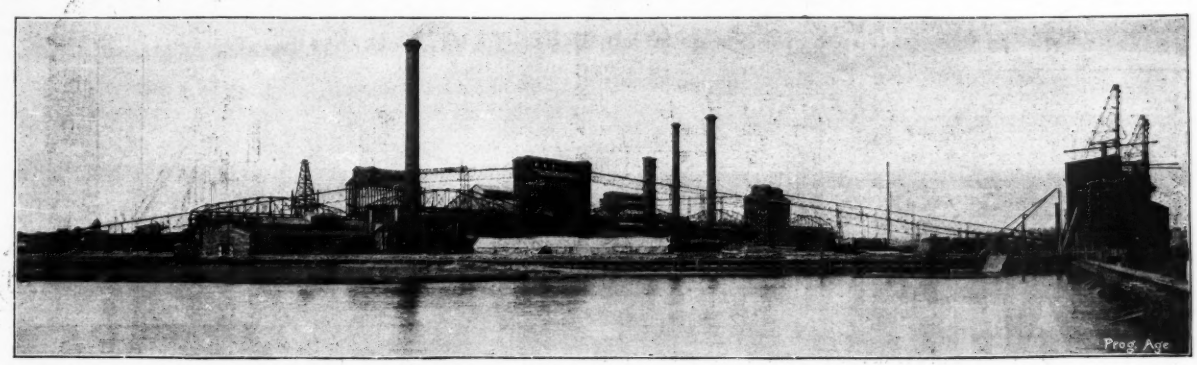


FIG. 3.—GENERAL VIEW OF THE WORKS SEEN FROM POINT X, FIG. 2.

It is during a short period in March or April only that the Cape Breton harbours (at Louisburg and Sidney), from which the coal is shipped, are ice bound; and consequently, with the beginning of the winter, sufficient coal will be accumulated to tide the works over this period. At present, the motive power for the coal towers on the top of the storage bin A, as also for the cable-driven machinery, is steam; but it is the intention to operate these by electricity. All the bins are of steel with wooden lining.

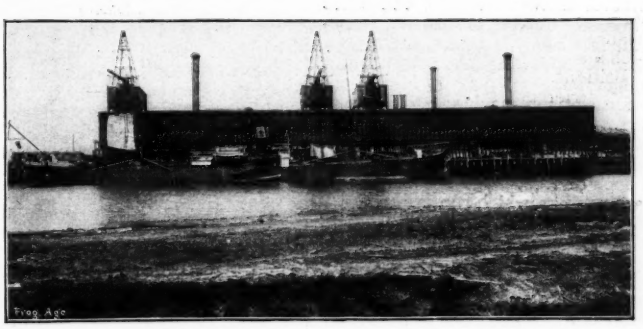


FIG. 4.—COAL-STORAGE BIN. UNLOADING FIRST CARGO OF COAL.

per charge. They are of the Otto-Hoffmann type, with several modifications to adapt them to the present requirements.

Fire-Bricks.—Unusual care has been taken in truing the bricks used for erecting the walls; and so successful have been these efforts, that no allowance had to be made for joints. The importance of obtaining gas-tight walls is manifest. As in these works the gas is of more importance than usual with coke-ovens, this care was wise.

It has been found that the average American fire-bricks are far more refractory than the European coke-oven bricks; but nevertheless even the best brands are generally not suitable for retort coke-ovens. The reason is the considerable shrinkage of these American bricks when exposed to high heat. The strains on coke-oven bricks are very severe, as the walls in the bottom flues are subjected to very high, continuous temperatures from all sides; while again, in another part—the retort proper—the bricks are subject to sudden cooling by the cold, and sometimes wet, coal charges, and to the mechanical abrasion of the coke charge when pushed out.

The first Otto-Hoffmann plants when built in this country—viz., at the Cambria Steel Company, Johnstown, and the Pittsburgh Gas and Coke Company, Glassport, Pa.—experienced considerable trouble on this account. But the problem had to be solved, as the introduction of the retort-oven into the United States depended upon the securing of suitable domestic fire-bricks, and it may be said that, by properly using various refractory materials, the problem has been solved so successfully that 60 ovens at Johnstown, now in continuous operation for two years, do not show the slightest cracks or deviations from their original dimensions.

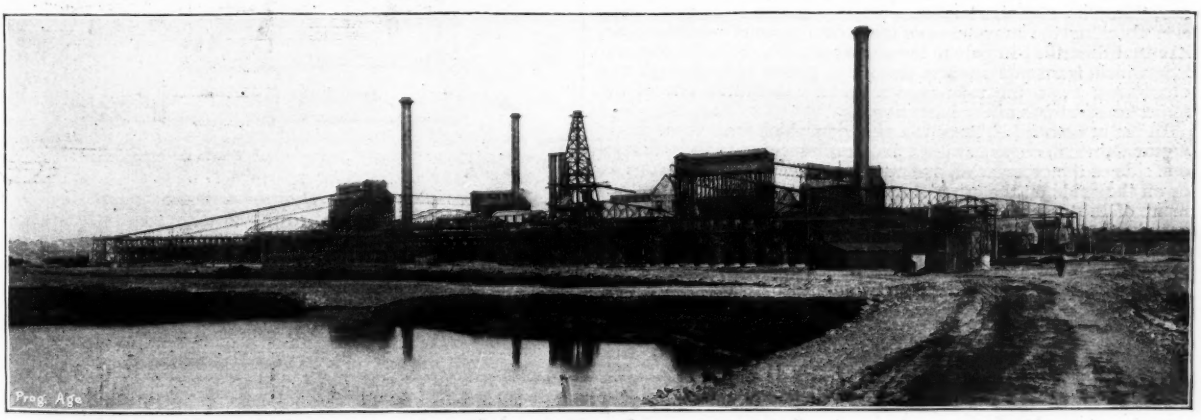


FIG. 5—GENERAL VIEW OF THE WORKS SEEN FROM POINT Y, FIG. 2.

THE COKE-OVENS.

General Arrangement.—The ovens are arranged in eight groups or batteries of 50 each, B 1 to 8, fig. 2. Two of these groups (100 ovens) form one working unit, and are supplied with coal from one bin. Batteries B 1, 2, 3, 4 are connected with the stack M; and B 5, 6, 7, 8 with stack N. The batteries are erected on high foundations for two reasons—viz., first, to bring the bottom of all the flues above extreme high water; and, second, to admit of dumping the coke into the highest railroad cars without another lifting.

At present batteries B 1 and B 3 are in operation; and battery B 2 is being heated by means of some surplus gas from batteries B 1 and B 3.

Capacity.—The retorts are 33 feet long, nearly 6 feet high, and 18 inches average width, and have a capacity of 6 tons of coal net

(To be continued.)

We are asked to point out that the Chairman of the Newcastle-upon-Tyne and Gateshead Gas Company, when referring, in the course of his speech briefly noticed in the "JOURNAL" last week (p. 549), to the fact that Newcastle stands fourth in the United Kingdom in regard to its manufacture and sale of gas, was alluding to gas companies' undertakings, and not to those carried on under municipal control.

THE BRONDER MACHINERY FOR DISCHARGING GAS-RETORTS.

In the "JOURNAL" for Feb. 5 (pp. 335-38) was described an improvement in retort-charging machinery of the West type; to-day an American make of machine rake falls to be described—the invention of Mr. G. A. Bronder, of New York. The suggested improvement relates principally to means to be employed for moving the rake-carrier; also to the connections of the moveably-fulcrumed counterbalance-lever from which the rake-lifter is suspended, and which constitutes an important feature of the inventor's previous patent No. 28,909 of 1897 (see "JOURNAL," Vol. LXXI., p. 1323). It further relates to means for connecting the rakes either with the rake-carrier or with the main frame or carriage of the machine.

Fig. 1.

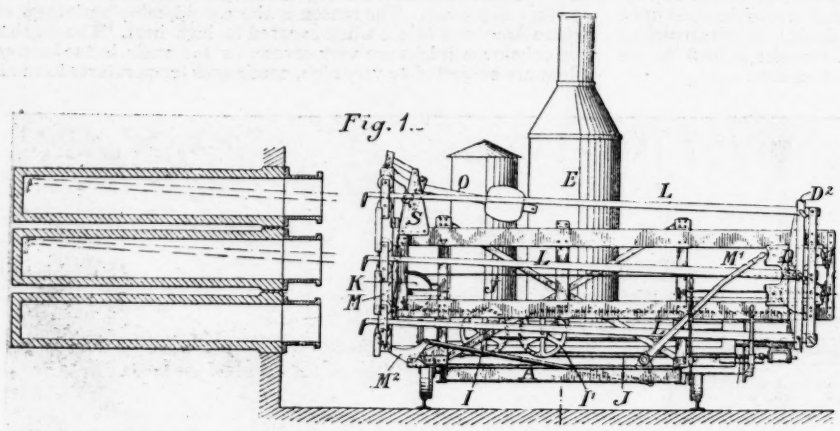


Fig. 4.

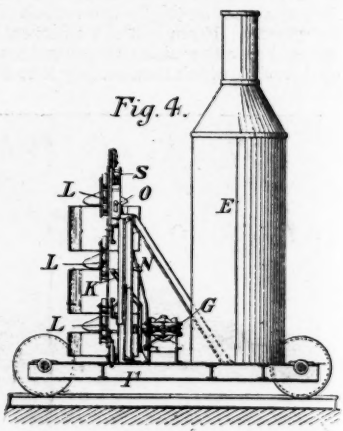


Fig. 1 is a side elevation of the machine, and a vertical section of one retort of each of three tiers. Fig. 2 is a side view of the rake-lifting-bar and its counterbalance lever, and the means for changing the position of the fulcrum of the lever. Fig. 3 is a plan of the machine. Fig. 4 is a transverse section. Figs. 5 and 6 are side views of part of the mechanism for moving the rake-carrier—representing it in different positions. Fig. 7 is a plan, and fig. 8 a side view of parts of the rake-carrier operating-mechanism (on a larger scale than the preceding figures).

Erected on the base or platform of the machine are uprights which support horizontal guides for the rake-carrier D, held together by uprights. The whole are brased diagonally, and constitute a carriage which is mounted on wheels running on tracks parallel with the front of the bench of retorts. The rake-carrier D is represented as furnished with rollers, which run between the horizontal guides in the main frame. The carrier derives its motion from a piston working in a horizontal cylinder of a direct-acting reciprocating motor mounted on the main frame or carriage, and supplied with steam from a boiler E. The piston-rod of the motor has connected with it a hollow cross-head F, which runs between horizontal guides on the main framing; and to the cross-head is also connected the rod of a piston which works in a hydraulic cylinder placed in line with the steam cylinder on the main framing. This hydraulic cylinder, which serves as a governor, "may be organized in any suitable manner for controlling and checking the movement of the steam piston"—for example, like that described in patent No. 28,909 of 1897. It is the mechanism which transmits motion from the piston-rod, through the cross-head F, to the rake-carrier which constitutes one of the important features of the invention.

In the cross-head F, there is a pin upon which there turns freely a gear G, which engages with a fixed rack secured to the guide on one side of the cross-head, and with a flying rack which runs in or on the guide on the other side of the cross-head. The movement of the cross-head produced by the piston-rod carries the gear backwards and forwards along the fixed rack, and so causes the gear to turn and produce a longitudinal movement of the flying rack twice the length of that of the piston-rod and cross-head. The flying rack carries (on two pins secured in it) two idler

Fig. 2.

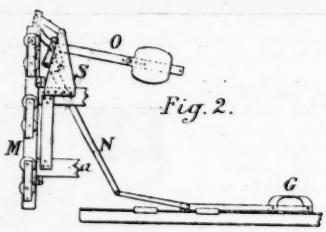
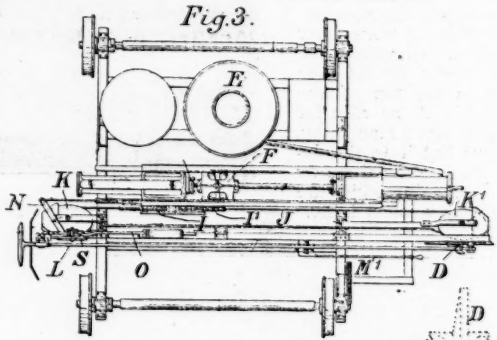


Fig. 3.



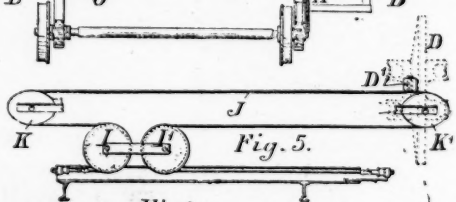


Fig. 5.

Fig. 6.

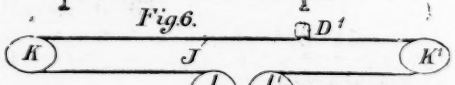


Fig. 7.

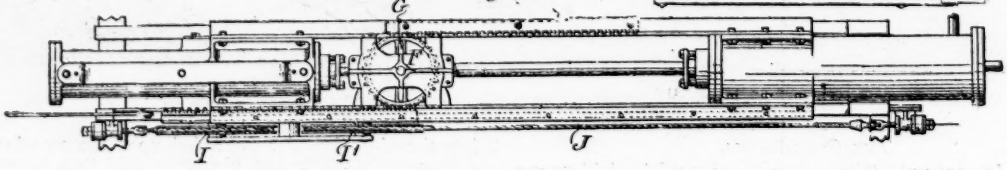
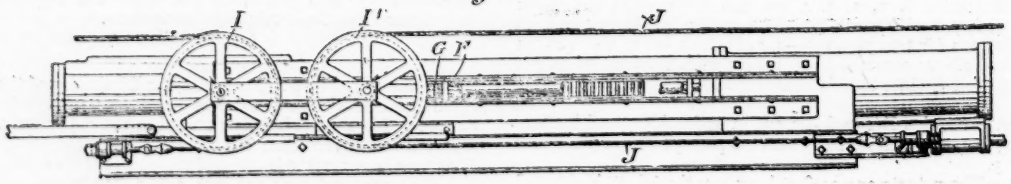


Fig. 8.



sheaves I I^1. A wire rope J, fastened at one end to the forward part of the main frame (as shown in figs. 5 and 6, and partly in figs. 1, 7, and 8), passes round the sheave I; thence to an idler sheave K carried by an arm on the main frame at the front end of the machine; thence backwards to the rake-carrier D, with which it is connected; thence to, and round, an idler sheave K^1 carried by an arm projecting from the main frame at the rear end of the machine; thence forward to, and round, the idler sheave I^1; and again backward to the rear end of the main frame, to which its other end is connected. The movement of the flying rack produced by the gear G pulling on the two parts of the rope running on its sheaves I I^1, imparts through the rope to the rake-carrier a movement equal to double the stroke of the rack; and hence, the rack having double the stroke of the steam piston and cross-head, the rake-carrier D has four times the stroke of the piston.

This rope J is preferably made of two lengths united at the connection with the rake-carrier D by a clamp on the carrier, as shown at D^1 in figs. 5 and 6. The connections of the ends of the rope with the frame are represented as made each with a screw take-up, consisting of a rod to which the rope end is attached, and which passes through a box bracketed on the machine framing and screw-threaded to receive a tightening nut. Between the nut and the outer end of the box is placed a rubber cushion, against which the nut is screwed up, to take up the slack of the rope, which, in this way, can be done quickly while the machine is in operation. The rubber cushions act as springs for preserving, to a certain degree, the tension of the rope. When, by the stretching of the rope (or from other causes), the take-ups have operated to their available limit, the clamp D^1 is unfastened, and one, or both, of the contiguous ends of the two lengths of the rope are drawn up through it, and brought to proper tension.

The patentee points out that, in retort discharging machines heretofore used, when one or more of the rakes were not required, and therefore had to be disconnected from the rake-carrier and connected with the main frame or carriage, it was necessary, after unpinning them from the carrier, to pull back such rakes by hand a considerable distance—requiring great exercise of strength by the attendants. To obviate this, the bars of the rakes L are made long enough to extend rearward a sufficient distance beyond the pin-plate D^2 of the carrier D to enable them to be pinned to the pin-plate of the main frame or carriage; and in each bar two holes are provided—one to receive the connecting-pin when it is inserted through the hole provided for it in the pin-plate D^2 of the carrier, and the other to receive it when inserted through the hole in the pin-plate of the main frame or carriage.

M is the rake-lifter, working vertically in guides on the main carriage. This lifter is operated (as shown in fig. 1) by a hand-lever M^1 on the main frame or carriage—the lower end of the lever being connected by a rod with one arm of an elbow lever M^2 on the forward portion of the carriage; while the other arm is connected with the bottom of the lifter. O is the lever applied to counterbalance the weight of the lifter and as much of the weight of the rakes as come upon the lifter. It has a moveable fulcrum, consisting of a pin supported in the upper arm of a lever N, and which has its own fulcrum in a standard S rigidly supported on the main carriage. The lower end of this lever is connected by a rod with a slide affixed to the cross-head F, and works in guides on the main frame. The rod and slide and the cross-head form a direct connection between the lever N and the piston-rod of the motor cylinder, whereby the piston-rod is made to operate the lever for shifting the fulcrum of the counterbalance lever O nearer to, or farther from, the rake-lifter M, as the rakes are moved forward and backward by the carrier D and a greater or less portion of their weight is brought upon the lifter M.

The connections between the fulcrum-shifting lever and the counterbalance lever, which are shown in figs. 1 and 2, are substantially like those described in the 1897 patent; the counterbalance lever being suspended from its fulcrum-pin by two links the upper ends of which are pivoted to the pin and the lower ends of which are pivoted to the lever by a pin. But the rake-lifter (instead of being directly pivoted to the counterbalance lever) is suspended from it by a link pivoted to the lever. The link is prolonged upward beyond the pin, and its upward prolongation is pivoted to one end of a radius-bar the other end of which is pivoted to any suitable part of the main frame or carriage—the stand S for example. By this link connection of the counterbalance lever with the rake-lifter and the radius-bar applied to it, it is possible to prevent almost entirely the production of any backward and forward thrust on the rake-lifting bar by the fulcrum-shifting lever and the counterbalance lever, and to substitute for the roller-guides heretofore used for the rake-lifter guides of any simple form in or against which it may slide freely.

Cement Manufacture.—At the ordinary meeting of the Institution of Civil Engineers last Tuesday, the paper read was on "The Rotatory Process of Cement Manufacture." The authors were Messrs. W. H. Stanger and B. Blount, and they claimed for this process of manufacturing cement that it presented the advantages that the operation is conducted continuously and mechanically instead of intermittently and by the aid of much hand labour, and that the product is better and more uniform than that obtained by the old method. The output per unit of plant was stated to be more than double that of the best fixed kilns, and the consumption of fuel smaller; while a cheaper class of fuel—viz., small coal instead of coke—could be used.

CARBURETTED WATER GAS.

At the Meeting of the Institution of Junior Engineers last Friday night, Mr. Samuel Cutler, jun., read a paper on the above subject. Necessarily, the author had to conform his paper to the character, from the technical point of view, of his audience. Many of them—perhaps the majority—are unconnected with gas-works; and consequently the paper was framed more for educative purposes than for conveying information that is absolutely new to the gas engineering profession. But here and there the author gave expression to opinions, and threw light on points, which readers who have not had practical experience of carburetted water-gas manufacture, and those who have had, will find it of interest to peruse.

The author started with a confession that the carburetted water-gas system has made a considerably greater advance in this country than he expected at the time he read a paper before the Institution in 1893, and in which he incidentally referred to the process. Within a period of less than ten years from the introduction of the system, the installations of plant represent, he said, a daily producing power of 120 million cubic feet, including the extensions of plant now under construction. A brief statement of the cardinal differences between coal gas and carburetted water gas, and an indication of the reasons why the adoption of the latter has been so extensive, followed. Naturally, in this connection, the author dwelt upon the conveniences and advantages of the system as known and recognized by most gas engineers. The fact was pointed out that the process of making water gas by the decomposition of water vapour in contact with incandescent carbon was by no means a recent discovery; it having been known in the laboratory for at least a century. For the author's purposes, it sufficed to say that an English patent was granted as early as 1839 in respect of this gas; and it has been a factor in many subsequent patents in various forms. In a few sentences, he traced the system to its stage of success; and to the pioneer work of the United States in connection with it he gave due acknowledgment. Returning to this country, he mentioned the first installation of the Lowe plant at Beckton, and gave information as to the gradual progress effected throughout the country.

The essential differences in the composition of coal gas and water gas were next clearly stated by Mr. Cutler, in order to prepare his auditors for an account of the agitation of four years ago over the toxic property of the gas, and the resulting departmental inquiry and report. Here he declared his opinion that English gas companies do not desire to use the process exclusively, and would willingly assent to a reasonable statutory limitation, in which case the proportion of carbon monoxide in the gas as supplied to the consumer might be about 20 per cent. Any legislation on these lines would not materially affect the present position of the process, as no English company are supplying the gas unmixed with coal gas, and according to the last parliamentary return only in two instances was a 50 per cent. limit exceeded during the year. Gas coke being the cheapest and most convenient form of carbon to use, the extreme practical limit is reached in a proportion of about 25 per cent. of coal gas and 75 per cent. of carburetted water gas, in which case all the coke produced from the coal-gas plant would be absorbed in the water-gas manufacture. But coke in reasonable quantity being a profitable residual, English gas companies are not desirous of reaching the limit at which no saleable surplus exists. A point was then made by the author of the disposition on the part of the opponents of the gas to argue that its adoption is entirely in the interests of gas concerns, and that its use is against the public interests. That this is not the case, he said, is obvious from the fact that so many of our municipal authorities—including Birmingham, Manchester, Coventry, Leicester, Stockport, Oldham, and many others—have adopted it.

No precise figures as to cost were given by the author; but he dealt with the point generally by remarking: The actual cost of the gas does not vary greatly from coal gas; it may be rather more or rather less according to local circumstances. The certainty, uniformity, and directness of the product, and the absence of perplexing residuals, however, render the process very advantageous. Theoretically, the process affords a means of converting coke and mineral oil almost wholly into illuminating gas. In coal-gas production, there is a surplus of more than 70 per cent. of the weight of coal carbonized left in the form of bye-products. Thus the one is independent of the sale of bye-products; while the other—the coal gas—cannot profitably be produced except for the value which at present attaches to such products.

Mr. Cutler's intimate knowledge of the construction of water-gas plant enabled him to discourse instructively on that part of his subject. He exposed a diagram giving in sectional elevation a complete apparatus for the production and purification of carburetted water gas, which might be considered as typical of what would be usually provided at a gas-works requiring an output of 2 to 3 million cubic feet per diem. By the aid of this, he described the apparatus in detail; and then he traced the manner in which the raw gas-making materials—viz., water, carbon, and petroleum—become transformed into the finished product.

The chemical aspects of the manufacture of carburetted water gas were next reviewed by the author. In this regard, he said: The process as understood here and in the United States involves two distinct methods of gas production in which two different types of raw materials are made to yield combustible gases. These methods are: (1) The water-gas process in which highly carbonaceous fuel—*e.g.*, coke—is made to react with steam to yield a combustible but non-illuminating gas when used in open-flame burners. (2) The carbonization process, in which petroleum or other mineral oil is carbonized to yield a combustible and very highly illuminating gas, and a small amount of solid and liquid residual products. These two methods of gas making as carried out in the ordinary carburetted water-gas process are, to a certain extent, independent, in that the water-gas process as a whole incidentally furnishes the heat requisite for the carbonization of the oil. Water gas may broadly be defined as the mixture of gases produced by the interaction of steam and hot carbon. The composition of this mixture may range from equal volumes of hydrogen and carbonic oxide to two volumes of hydrogen and one volume of carbonic acid. These extreme results may be represented by the following equations, disregarding intermediate changes :—

$$C + H_2O = CO + H_2$$
$$C + 2H_2O = CO_2 + 2H_2$$

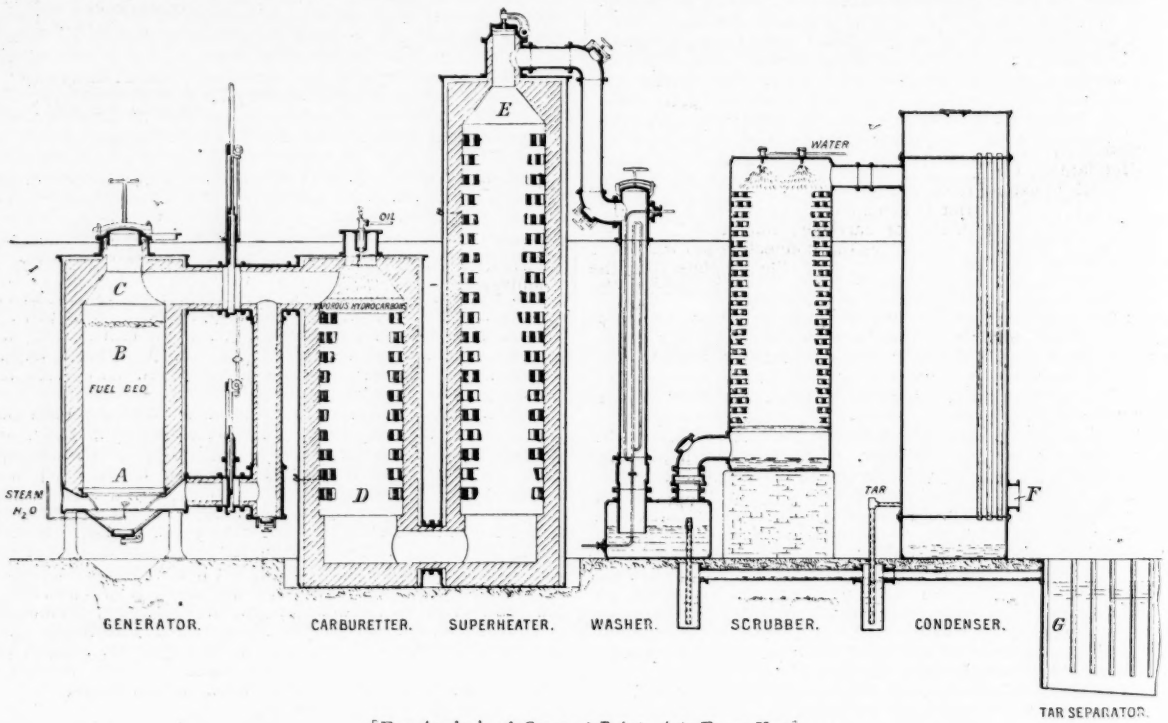
The gas produced by the first equation, consisting of carbonic oxide and hydrogen in equal volumes, would have a high calorific value affording a good mixture for illuminating by means of incandescent mantles, by reason of its high flame temperature, or for use in ordinary burners after carburetting. The gas produced by the second equation, consisting of one volume of carbonic acid and two volumes of hydrogen, would have a much lower calorific value, and consequent lower flame temperature; the mixture would still be a practical one for lighting by incandescence, but useless for ordinary burners. When, however, the relative values of these two extreme mixtures are compared for the dilution of high illuminating oil gas for lighting by means of ordinary burners, the first mixture is found to be superior, because it has been proved practically that even a small percentage of carbonic acid in illuminating gas greatly lowers the degree of incandescence of the carbon particles to which the luminosity of ordinary flames is due. Although less carbon is consumed in the production of a given volume of gas in the second equation, the mixture is practically useless as a component of carburetted water gas; and the operator should, as far as possible, refrain from making a mixture approaching it. Hence it is desirable that the interaction between steam and carbon should follow the course indicated in the first equation—viz.,

$$C + H_2O = CO + H_2,$$

which is the one which occurs when steam is passed through an excess of incandescent carbon—that is to say, if no steam passes through the fuel undecomposed, the only products will be hydrogen and carbonic oxide. If steam is present with the water gas at the top of the hot bed of fuel, it reacts with the carbonic oxide of the gas, and produces carbonic acid and hydrogen, expressed as—

$$H_2O + CO = H_2 + CO_2.$$

To prevent the occurrence of this secondary reaction, it is necessary to avoid the presence of an excess of steam. It therefore becomes necessary to keep the fuel in the generator at such a high temperature that steam may be freely admitted. An average temperature of about 1600° Fahr. is probably economical for water-gas manufacture. But a very slight drop from that temperature would mean a considerable falling off in the gas, while a higher temperature means only a slightly greater consumption of fuel for its maintenance; and it is essential to commence each run with a fuel-bed temperature of 1800° to 2000° Fahr.



[For Analysis of Gases at Points A to F, see Key.]

The following reactions were until recently generally accepted as those occurring in the generator—

$$2H_2O + C = 2H_2 + CO_2;$$

this reaction taking place at the base of the generator; the steam splitting up into hydrogen and oxygen—the former being liberated, and the latter combining with the carbon producing carbonic acid. The secondary reaction converted the carbonic acid into carbonic oxide by taking up more carbon in passing through the deep fuel-bed, and expressed in the equation—

$$CO_2 + C = 2CO.$$

In practice, however, it was presumed, owing to the imperfect reduction of the CO_2 to CO, a slight surplus of CO_2 generally remains in the finished product, consisting of hydrogen and carbonic oxide with a small quantity of carbonic acid. But this small percentage of carbonic acid is now held to be formed somewhat differently, as just described.

The author next directed attention to a diagram prepared to illustrate graphically the reactions occurring in the generator, and to show the various changes in the composition of the gas in its different stages of development into the finished product. Analyses of the water gas issuing from the generator from samples taken at each minute of the run were tabulated, in order to show the increasing proportion of carbon dioxide. The formation of this gas is due to the gradual reduction of temperature in the fuel-bed, and consequent relative increase of the presence of free steam, which reduces the carbonic oxide to the acid, and adds to the volume of hydrogen, all of which is clearly indicated by the analysis. The percentage of carbonic acid, however, is low—in fact, lower than usual, and points to the fuel having been brought to a good condition for gas making, and to proper regulation of steam. The analysis of the gas at the base of the carburettor indicates the addition of the illuminants derived from the carburetting materials. The gas is increased in volume here by the addition of the oil gas, representing about 60 to 80 cubic feet of gas per gallon of oil according to the grade used. It would appear from this analysis that the oil was not completely gasified, because the constituents of the gas derived from the oil—marsh gas and hydrocarbons—increase between this vessel and the upper part of the superheater (at which point the third analysis was taken). Hence this vessel quite properly carries out its function of converting condensable oil vapours into permanent gas. A final analysis is made of the gas from a sample taken at the outlet of the condenser, which indicates a slight reduction in the quantity of the hydrocarbons removed by the washer-scrubber and condenser, and which will probably be found in the tar, while the carbonic acid is also reduced, having doubtless been partially

KEY TO DIAGRAM, BEING ANALYSIS BY W. J. ATKINSON BUTTERFIELD OF SAMPLES TAKEN BY HIM FROM A PLANT IN ORDINARY WORKING.

A.—$H_2O + C = H_2 + CO$.

B.—2 to 4 °/₀ of CO_2 formed thus $H_2O + CO = H_2 + CO_2$.

C.—*Analysis of Water Gas from Generator each Minute of Run.*

Minute of Run.	1	2	3	4	5	6	7	Average.
Hydrogen	50·20	50·45	50·84	50·85	51·13	51·38	51·46	50·90
Carbonic oxide	49·14	48·78	48·08	47·83	47·05	46·15	45·12	47·45
Carbonic acid	0·66	0·77	1·08	1·32	1·82	2·47	3·42	1·65
Marsh gas				Traces				
Nitrogen				Traces				

D.—*Gas after Carburetting.*

	Per Cent.
Hydrogen	39·37
Carbonic oxide	38 43
Carbonic acid	1·71
Marsh gas	9·54
Nitrogen	2·54
Hydrocarbons	8·41

E.—*Gas after Fixing.*

	Per Cent
Hydrogen	34·33
Carbonic oxide	33·95
Carbonic acid	1·83
Marsh gas	11·92
Nitrogen	3·04
Hydrocarbons	14·93

F.—*Gas at Outlet of Condenser.*

Hydrogen	35·17	Hydrocarbons (C_nH_m)	12·83
Carbonic oxide	33·92	Do. (C_2H_6)	1·20
Marsh gas	13·58	Carbonic acid	1·54
		Nitrogen	1·76

G.—*Separated Tar.*

Composition of Separated Tar from one of Messrs. Cutler's Plants, April, 1899. The specific gravity of the tar at 60° Fahr. was 1·089, and on distillation it yielded the following products :—

—	Specific Gravity.	Percentage by Weight.
Light oils collected between 171° and 338° Fahr.	0·8905	5·72
Middle oils collected between 338° and 518° Fahr.	0·9920	27·30
Heavy oils collected between 518° and 652° Fahr.	1·0620	28·28
Pitch	1·2750	33·88
Water	1·0000	4·82
		100·00

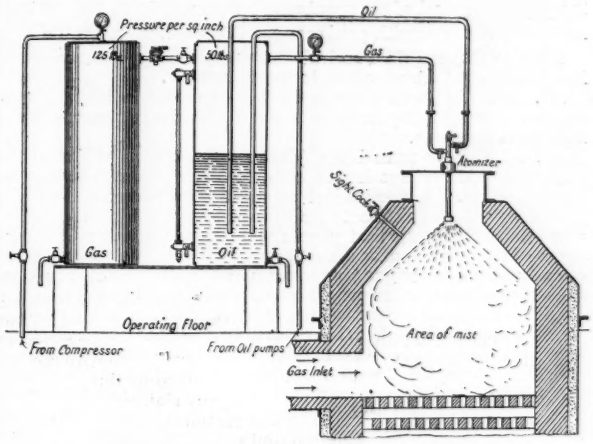
absorbed by the condensed steam and water in the washer and scrubber. All these analyses have been prepared by Mr. W. J. A. Butterfield from samples taken by him personally from a plant in the ordinary course of working.

A detailed description of the method employed in withdrawing and separating the tar having been given by the author, he referred to some of the latest improvements in plant. Among other points, he called attention to the introduction of interlocking gear, in order to ensure safety. The alternation of gas and air in the same vessels presents the possible requisites for explosion; and although the two vapours should not be in explosive conjunction, there is a possibility of this, if, by negligence or forgetfulness, an operator opens a steam-valve, and starts making gas before closing the air-valves. To avoid this mischance, which may often be harmless, but may under some circumstances be one of risk, the method of interlocking the steam and air valves has been devised, and is fitted to a number of plants now in operation. Its principal feature, Mr. Cutler explained, is the projection of cottars into slots in the air-valve spindles, actuated by the same lever that turns on the steam. Thus, until all the air-valves are shut down and the slots brought into such a position as to allow the cottars a free passage, the spindle cannot be turned to open the steam-valve. On the other hand, in taking the run off, until the steam-spindle is reversed, and the cottars withdrawn from the slots in the air-valve spindles, the opening of any air-valve is prevented. The gear is automatic in action, and entails no further work on the operator—in fact, it assists him in carrying out in proper sequence the various manipulations necessary in changing over from run to blow, or *vice versâ*.

Where water-gas plant is situated in residential neighbourhoods, it is sometimes found advisable to provide for arresting the coke dust that issues from the superheater chimney during the blow. Fine particles of coke are mechanically carried in the air-blast from the generator, and may, by depositing on buildings in proximity to the plant house, cause a nuisance. By means of a diagram, Mr. Cutler showed a form of interceptor that has been applied at several works where the deposition of dust would have caused difficulty. It is simple in action, and inexpensive to maintain. The dust is passed through water vapour, and caused to precipitate by impingement on baffle-plates, and then withdrawn from the receiving-tank in the form of sludge. The sludge-valve is operated by means of a chain from the operating-floor; and once a day the sludge is removed by drawing it off into a portable tank on the ground level.

In a consideration of the use of water gas for industrial purposes, the author expressed the view that there is a wide and increasing field for lower-grade gases. For their production, a simpler type of apparatus than is required for carburetted gas can be used; and he instanced, as a reliable example, the Dellwik plant.

Referring to carburetted water gas, Mr. Cutler remarked that in view of the fact that the oil expenditure represents a large percentage of the cost of carburetted water gas, it is to be expected that engineers using the process will value any improved means that produce a greater efficiency per unit of oil. He therefore called attention to the system of oil injection devised by Messrs. Botley, of Hastings. The principal object is the conversion of the oil into a form of mist at the moment of its injection into the carburettor; and the securing, by means of a special vaporizing and mixing chamber, of an instantaneous and thorough diffusion of the various gases. Oil in this condition, said the author, is manifestly in a better state for volatilization than by injecting it in a liquid state, and is more readily gasified by the hot gases from the generator and by contact with the heated chequer-work.



THE BOTLEY SYSTEM OF OIL INJECTION.

The apparatus (as shown in the accompanying sketch) consists of two cylindrical steel reservoirs—one of which is intended to contain oil, and the other compressed gas—and a special atomizer placed on the top of the carburettor, in direct communication with the reservoirs. The gas—purified carburetted water gas—is stored in the reservoir at 125 lbs. per square inch pressure, and later reduced to 50 lbs. in passing through the reducing-valve to the oil-reservoir. A feature of the system is the gradual decrease of the quantity of oil injected corresponding to the decreased production of water gas as the run proceeds; this being accomplished by allowing the pressure to gradually fall over the period occupied by the run.

In concluding his paper (which had dealt with the subject with considerable fulness from the varied standpoints indicated in the foregoing *résumé*), the author said: The future of this industry, owing to the present and past prices of oil, is one which must necessarily be viewed in varying aspects by various individuals. The price of oil being the principal factor, the market value of this commodity determines to a large extent in the majority of cases whether carburetted water gas will be as extensively adopted in the future as it has been in the past. Tables have been prepared showing the differences during the past few years of the two most important materials which constitute the cost of production of carburetted water gas—viz., oil and coke; the cost of labour, purification, and incidental charges remaining a fairly constant factor.

Price per Gallon of Oil Delivered to Gas-Works.

Plant No.	1896. d.	1897. d.	1898. d.	1899. d.	1900. d.	1901. d.
I.	3⅝	3	2⅝	3¼	4¼	4¼
II.	—	2⅝	2⅝	3¼	5¼	5¼
III.	—	3	3	3½	4	5¼
IV.	—	2½	3	3½	4⅝	4⅝
V.	—	—	—	3¼	5¼	5¼
VI.	—	—	—	3 9/16	4⅛	4⅛
VII.	—	—	5¼	4	4	5
VIII.	—	—	3¼	3¼	4 7/16	4 7/16

Price per Ton of Coke Charged to Plant.

Plant No.	1896. s. d.	1897. s. d.	1898. s. d.	1899. s. d.	1900. s. d.	1901. s. d.
I.	11 0	10 6	12 10	15 6	18 4	18 4
II.	—	9 6	9 6	12 3	14 9	18 0
III.	—	—	7 6	12 0	14 6	20 0
IV.	—	10 0	10 0	10 0	15 0	15 0
V.	—	—	—	—	—	—
VI.	—	—	—	20 0	20 0	20 0
VII.	—	—	21 0	21 0	21 0	21 0
VIII.	—	—	15 0	15 0	15 0	15 0

As the supply of petroleum oils is generally considered to be quite equal to the demand, the cause of these enhanced prices is a little difficult to comprehend. In former times, with these commodities at lower prices, the cost of carburetted water gas compared very favourably with coal gas on the basis of equivalent illuminating value; but at the present time, owing to the price of oil, the system relies more upon the well-known collateral advantages. That these advantages are not mere sentiment is supported by the fact of the survival of carburetted water gas under the existing conditions. That there is no diminishing use of the plants already installed, that companies and municipal

corporations are adopting and extending the process, indicates that its advantages are solid and definite. It is, however, likely that the near future will witness many developments in the production and use of gases having a lower illuminating value; thus enabling gas suppliers to discontinue the artificial enrichment of their coal gas to the present legal standard. Although the carburetted water-gas process has attained considerable proportions, it only represents a small portion of the total gas production, and should be viewed only as a useful auxiliary. The actual make of carburetted water gas according to the latest parliamentary returns is less than 10 per cent. of the total gas produced in this country.

The discussion wandered considerably outside the subject of the paper—several of the speakers appearing to have a more intimate acquaintance with producer gas than carburetted water gas.

The CHAIRMAN (Mr. Percival Marshall) having spoken of the indebtedness of the members to the author,

Mr. HAL WILLIAMS proposed a vote of thanks to him; directing his accompanying remarks to the utilization of power gas for industrial purposes.

Mr. H. CARTWRIGHT REID (Chatham) seconded the motion; observing that perhaps it was only natural that one who was so much interested in the subject of carburetted water gas as Mr. Cutler should not allude to its disadvantages. He believed he was correct in saying that people who resided in the neighbourhood of gas-works noticed a difference directly the manufacture of carburetted water gas was commenced; and as to the odourless character of pure water gas, he questioned whether gas companies would be prepared to continue to go to the expense of making it pungent. The author further told them that in no case did a gas-works produce water gas to the extent of more than 50 per cent. of the total make. He (Mr. Reid) was not prepared to dispute this; but he did know of an instance in which a gas company claimed that not more than 40 per cent. of their output was carburetted water gas. But they made their gas at two different works—at one they produced coal gas entirely; at the other, they made a small amount of coal gas and a large amount of carburetted water gas. Gas was supplied to the district close to this carburetted water-gas plant; and he thought it naturally followed that this particular district received a larger proportion of water gas than the other part of the company's area. This came pointedly to him in this way: The Welsbach Company wished them to buy some of the new Kern burners at the Chatham Dockyard. The burners were fitted up in a large room; and one night when he (the speaker) was there, these burners kept up a succession of little explosions. Complaint was made; and the Kern burners were replaced by ordinary incandescent ones. The company sent an expert down, who explained that carburetted water gas was being manufactured in large proportion; and the particular form of burner supplied was not adapted to the particular proportion of water gas distributed. They altered this by changing the nipples from 0·95 mm. to 1 mm. diameter. This was not much; but it made a difference. The expert explained that ordinary coal gas required a proportion of 5 of air to 1 of gas to form an explosive mixture; but that slightly more carburetted water gas was needed. The little explosions were caused by the attempt of the gas to light-back to the nipple at the bottom of the burner. Of course, while this was going on, the mantles were quickly ruined.

Mr. W. J. A. BUTTERFIELD, invited to speak, said he had not expected to be called upon; but he might congratulate Mr. Cutler upon the clear exposition he had given of the water-gas process. He proceeded to explain to the members the changes that had to be made in the original water-gas plant as introduced from America, in order to adapt it to English conditions, and then said that, in the plant as now described by Mr. Cutler, they saw the benefit that had accrued from the changes effected. The working of the plant was really marvellously good; the figures for the generator were exceptionally so. Some seven or eight years ago, when they were experimenting with the earlier plants, they would have scarcely supposed these results could have been obtained. The very low amount of carbonic acid found in the ordinary course of working had a double advantage: It meant a saving of fuel in the generator; and, if they attempted to remove it, a saving in purification. If the percentage of carbonic acid was high, they must either remove it or the illuminating power of the gas used in the ordinary open-flame burner would be very seriously diminished. To remove it from the gas by lime purification was, of course, in many cases, a costly item. But in this plant, as shown by the analysis, the proportion of carbonic acid was really practically the same as in crude coal gas; and it was only in a comparatively few places that the carbonic acid was removed from coal gas. There was one other point with regard to the use of water gas in incandescent burners. It was perhaps not commonly understood that practically, when burning gas in an incandescent burner—that was to say, in a bunsen burner—they really, when using coal gas, formed water gas in the cone of the flame. They burned it to what was substantially water gas by means of the inner air supply, which passed in the holes at the bottom of the burner, and they burnt this water gas in the outer zone of the flame to heat the mantle. It struck one that, if they were going to treat the coal gas in this way, it was rather better to supply water gas straight away to the burner, and save the burner the trouble of converting the coal gas. Naturally, if they had the water gas already formed, they would not need the internal air supply to convert it to water gas. One speaker had made a remark as to the necessity of enlarging the nipple at the base of the burner to admit more gas when there was a proportion of carburetted water gas in the supply. If, instead of doing this, they cut down the internal air supply, they would have retained the proper proportions in the mixture—the proper proportion of water gas to give a non-luminous flame to heat the mantle. It was not at all necessary to increase the consumption because they had water gas as part of the gas supply; the same, or even a higher, efficiency could be obtained by cutting down the internal air supply. The only thing necessary was to obtain the proper proportions in the mixture that reached the top of the burner.

Mr. G. C. ALLINGHAM put a number of questions to the author. Among them he desired to know how water gas compared with producer gas in regard to calorific value.

Mr. W. G. WERNHAM inquired the cost per 1000 cubic feet of producing gas by the various types of water-gas plant. He also asked whether any reliable test for carbonic oxide had been devised since the Departmental Committee sat. In the event of a restriction being put on carbonic oxide in the distributed gas, a test of the kind would be absolutely essential.

Mr. A. T. SWAYNE and Mr. ERNEST KING added a few remarks.

Mr. G. H. ROBUS said he understood Mr. Cutler to say that the price of this plant was somewhat cheaper than ordinary coal-gas plant. But looking at the very beautiful plans before them, he (Mr. Robus) thought some error had been made, as he found that nearly all the same sort of plant was required for both systems, except in the actual producing plant. He should like to know whether Mr. Cutler had taken the purifiers, station meter, and other apparatus into consideration.

Mr. D. G. SPITTLE inquired the smallest installation of water-gas plant that could be economically put down.

Mr. CUTLER, in reply, said he could not really, in the time at disposal, enter into the question of producer gas; but he might mention, in answer to one question, that the calorific value of the Mond gas was about 148 British thermal units, against 280 for pure water gas, and 600 for carburetted water gas or ordinary coal gas of the same illuminating value. In other words, if they took the ordinary coal gas or the carburetted water gas as 4, the pure water gas as 2, and the producer gas as 1, they had the relative values between the different gases. As to the suggestion that the percentage of carburetted water gas might be greater in one district than in another in the same area of supply, he dealt with this by explaining that the gas was stored in the ordinary holders on the works, and readily diffused with the coal gas, before being delivered into the district. The Parliamentary Returns showed there was only one company who came out with a larger proportion than 50 per cent. To clear up certain points, he gave further information as to the operation of the plant. Regarding the use of carburetted water gas in incandescent burners, he remarked that it was unnecessary to touch on this after what Mr. Butterfield had said. Respecting the cost, that hardly came into the paper; but it compared pretty favourably with coal gas. Of course, it depended largely on the price of oil. When oil was at 3d. per gallon, the gas could be made cheaper than now with the cost at 5¼d. But the cost of coal gas had gone up correspondingly. The question of cost was also affected to a large extent by local circumstances. The smallest installation of carburetted water-gas plant in this country was one for making about 125 cubic feet per diem. Mr. Cutler concluded by describing the operation of the apparatus by the aid of a model.

The vote of thanks was very heartily accorded.

Progress of the Sheffield Water-Works under the Municipality.—The officials of the Sheffield Corporation Water Department were entertained to dinner last Tuesday by Alderman Gainsford. In the course of the toast list, he gave "The Staff," and referred to the hearty co-operation of the officials in carrying on the administrative work. The General Manager (Mr. W. Terrey) responded; and he took the opportunity of alluding to the great strides made since the municipalization of the undertaking in 1887. In the past fourteen years, he said, the water revenue had been increased by £50,000, and money had been set aside out of revenue for the reduction of capital amounting in all to nearly £88,000. There was an accumulated surplus of £50,000, which would all be wanted for constructing new works, and partly for the reduction of the 25 per cent. extra charges (the circumstances connected with the imposition of which have often been referred to in the "JOURNAL"). With regard to this 25 per cent., the first 12½ per cent. was taken off in 1897; and in September the remaining half would cease to be levied. This would mean a total reduction in income from September next of £24,000, which would go into the pockets of the consumers. The success of the undertaking was often not realized, because they did not hand over the profit in a tangible form in the relief of the rates, as the Tramway Committee were able to do. With regard to a scheme of superannuation for the employees of the department, he said that they all realized the need for some such arrangement. A scheme was wanted to include the whole of the Corporation employees, from the Town Clerk to the scavenger. The department, he further mentioned, had now in hand the revision of the whole of the assessments in the water area. Mr. Terrey proposed Alderman Gainsford's health, who, in reply, said that the Committee were quite willing to establish a superannuation fund for employees. The City Council, however, had taken the matter out of their hands, and for the past twelve months had been "making inquiries," with no result. He intended to bring the matter up again, and induce the Council to take some practical step. No department of the Corporation was likely to be more profitable to the ratepayers than the water undertaking.

REGISTER OF PATENTS.

Treating Liquids and Solids in the Manufacture of Gas, Coke, &c.—Naef, P., of New York. Nos. 23,404 and 23,415; Nov. 23, 1899. Date claimed under International Convention, April 26, 1899. Also No. 2888; Feb. 13, 1900. Date claimed, July 13, 1899.

In the "JOURNAL" for Dec. 11 last, an article appeared entitled "An Ambitious Inventor," in which reference was made to a previous series of this "inventor's" patents; and it was then stated that it was impossible to give an intelligible account of his proposals, which appeared intended to claim "protection for nearly every conceivable modification of the common processes of gas and coke manufacture."

To-day we have nominally three specifications to deal with in the briefest abstract, but really twelve—inasmuch as the Patent Office authorities refused to pass a "combination" specification in the last two instances, and made the applicant split his description into four and seven parts respectively.

Patent No. 23,404 of 1899 relates to the treatment of liquids by evaporation, distillation, or cooling, or the treatment of liquids with gases by precipitation of solids from liquids; and it chiefly consists in "an improved method of, and apparatus for, carrying out such treatment, whereby economy of heat, or of the heating or heat-absorbing agent, is attained, and whereby also liquids that form scale or precipitates during evaporation, distillation, or cooling can be successfully treated." A further object is to provide "apparatus for effecting such treatment having greater capacity than apparatus heretofore constructed."

Patents No. 23,415 of 1899 relate to the treatment of solid materials with the application, regulation, or withdrawal of heat, and are said to be applicable to such processes as the distillation of bituminous fuel for the production of illuminating gas and coke, the manufacture of water gas by the action of steam on fuel, the destruction of sewage matter and recovery of ammonia therefrom, the calcination of limestone and cement, the production of carbon dioxide and carbon monoxide, and to the carrying out of catalytic reactions requiring a constant temperature—such as the manufacture of sulphuric acid from sulphurous acid, of chlorine from hydrochloric acid gas, the reduction and smelting of ore, or the manufacture of sulphur trioxide from sulphur dioxide.

The chief objects of the several inventions are to economize heat or the heating or cooling agent; to treat large quantities of material and gas in a single apparatus; and to conduct such operations as the burning of limestone without the presence of nitrogen in the apparatus, or with a less quantity of nitrogen than heretofore. The patentee proposes to apply heat to, or abstract heat from, the material to be treated by circulating gases or vapours in heaters (or coolers) forming a part of the apparatus. The gases are passed through the material until they are cooled to a temperature at which the operation to be carried out ceases for practical purposes. Then the gases are again heated and brought into contact with the material. A continuous circulation of heated gas through the material is thus obtained; the material itself being preferably also moved through the apparatus. The excess of the gases or vapours produced during the operation is conducted through the material to be treated, and all the heat is abstracted from it.

Nos. 2888 and 2888A of 1900 refer to (1) A method of gasifying fuel to enable the bye-products (ammonia and tar) to be recovered without treating the entire volume of gas for their recovery. (2) A producer which will gasify large quantities of fuel continuously, and without much labour. (3) To produce a better quality of tar-oils than is usually obtained in gas-producers. (4) To obtain most of the gas free from tar vapours. (5) A method of gasifying fuel which furnishes most of the ammonia and tar obtainable from the fuel with the simultaneous melting of the cinders. (6) Improved methods for introducing water in gaseous or liquid state into the generator. (7) The production of illuminating gas or water gas free from nitrogen, and the separate production of producer gas in the same apparatus. (8) An improved means of running off the cinders in a liquid state. (9) To produce ammonia from the nitrogen of the atmosphere, as well as from the fuel. The patentee remarks that, even where the bye-products are not intended to be recovered, the process is "of advantage, as the smoke containing such bye-products can be employed as fuel." The method consists in first treating the fuel for the production of bye-products and rich gas, and afterwards gasifying it with air (or preferably a mixture of air and steam, if desired), with simultaneous melting of the cinders in the same apparatus; the producer gas being kept separate. There is thus obtained a small amount of rich gas containing tar and ammonia, which can be treated separately, and a much larger volume of gas which can be used for firing boilers, in furnaces, in gas-engines, or for other purposes.

No. 2888B refers to the same matters as the above (1) to (9). The apparatus here allows "a thorough elimination of ammonia from the coke, and shows novel methods for introducing and producing the steam required in the process." Fuel is fed into the apparatus by a special charging arrangement, and is treated in the upper part of the furnace with hot gas and steam; while in the lower part the coke is burnt preferably with a mixture of air and steam or air carrying water in a fine state of division.

The apparatus described in patent No. 2888C contains special features for treating the cinders so as to get valuable bye-products from them; also for utilizing the heat of the hot producer gas leaving the apparatus. "It renders possible the production of gas containing only a small amount of nitrogen, in the upper part."

In the arrangement referred to in patent No. 2888D, gas of considerable illuminating power containing ammonia and tar vapour, and ordinary producer gas, are obtained separately from the same apparatus. It consists of a shaft (supported on columns) with an iron mantle and a fire-brick lining. Near the base, it has a part for melting the cinders, fitted with an outflow and ducts, some distance above which are gas off-takes. In the upper part, the shaft is lined with hollow tiles forming flues which run separately in vertical direction and terminate at the top at an annular flue, which is in communication with the chimney. Pipes conduct gas or steam into the apparatus; and near the top is a gas-exit to convey illuminating gas to any suitable type of apparatus for recovering ammonia and tar.

Patent No. 2888E relates to a furnace designed for the purpose of producing a gas containing practically no undecomposed steam, and simultaneously a large amount of ammonia. It has inlet-ducts and an annular channel for introducing water in the liquid or gaseous state, with gas-orifices and a channel communicating therewith. A gas-heater (of any suitable construction) communicates with this channel; and, at the other end, the heater communicates with a fan. At the base, the furnace is provided with a funnel-shaped bottom adapted to be closed by sliding doors, and furnished with rotary discharge-rollers.

Patent No. 2888F specifically relates to a modification of No. 2888B. Here the operation of the apparatus can be so modified that the gas off-takes above the lower part of the apparatus are used for introducing a secondary blast containing water. Through the lower inlets, sufficient air is introduced to burn all combustible matter from the cinders, and, if desired, to melt the cinders. In the former case, this blast may have some water or steam admixed; but if the cinders are melted, a dry blast (preferably heated) is used below. Most of the blast is introduced holding steam or water in a fine division, so as to prevent the destruction of the ammonia.

Gas for Illuminating and Heating Purposes.—Arzt, A. H., of Margaret Street, W. No. 4736; March 13, 1900.

This invention relates to "a substance which, when air is passed through or over it, will produce a gas of good heating and illuminating properties, or which will enhance these properties, in coal or other gas, if the latter is passed over or through the substance."

The proposal is to mix very fine powdered pumice-stone with magnesia powder (magnesium oxide, MgO) and water, and work the mixture into a thick paste or dough, which is rubbed through a sieve so as to divide it into small lumps, which are dried in a current of hot air, and then calcined in an oven or furnace similar to those used in carbon or brick works. The lumps or stones thus formed are very light and porous; and when perfectly cooled down they are ready to be impregnated, first with silicic-triethyl-formate, $4SiH(OC_2H_5)_3$; and then with liquid hydrocarbon spirit or other volatile substances, or mineral oils of a like nature in which a small quantity of metallic sodium, or amorphous table salt, or crude camphor, $2C_{10}H_{16}O$, has been suspended.

The stones thus prepared are now placed in a chamber provided with one or more inlet and outlet tubes—the former to connect it with a reservoir containing air or coal or other gas under pressure, or with some device for forcing air or gas through the chamber, the latter to connect it with the burners.

The following serves (according to the patentee) as an explanation of the invention, and to show its distinction from other similar devices: "Pumice-stone is a mineral of volcanic origin, and generally considered as a trahitic glassmagma, though it is not a glass in the proper sense of the word. It is a trisilicate of the type of $H_{12}Si_3O_{12}$, in which five molecules of water have disappeared, thus leaving a mass in the form $H_2Si_3O_7$ behind. By heating this substance with magnesium oxide in the way described, the rest of its hydrogen is expelled and replaced by magnesium, giving a highly porous and absorbent mineral of peculiar chemical properties and the formula $MgSi_3O_7$. It has the valuable quality of completely assimilating into its mass an addition of silico-triethyl-formate; and when impregnated afterwards with hydrocarbonic spirit, mineral oils, or similar volatile substances, which contain a small amount of either metallic sodium, or amorphous table salt, or crude camphor, will give out fumes of silicic hydrogen SiH_4, which readily mixes with similar hydrides of carbon from the hydrocarbons employed, and together forms a gas of hitherto quite unknown qualities for heating and lighting purposes. The mineral thereby splits into $MgSiO_3SiO_2SiO_2$, *plus* tetrethylic silicate $3Si(OC_2H_5)_4$, which, however, can be distilled over and reconverted into triethylformate, simply by conducting into it the fumes from magnesium-silicon which had been moistened with hydrochloric acid. Likewise, the same trisilicate of magnesium is formed, if after a preliminary heating and washing the above-mentioned products found in the carburetter are treated in the way first described.

$$Mg_2Si + 4HCl + 3Si(OC_2H_5)_4 = 2\,MgCl_2 + 4SiH(OC_2H_5)_3$$
$$MgSiO_3 + SiO_2 + SiO_2 = MgSi_3O_7$$

The presence of silicic hydrides in hydrocarbon vapours not only greatly increases their illuminating and heating power, but prevents their condensation in the pipes or tubes employed to convey the gas to any distance. This tendency to condense has been one of the principal drawbacks to the use of similar systems on a large scale."

Internal Combustion Engines.—Hamilton, J. H., of Sandiacre, Derby. No. 4897; March 15, 1900.

The first part of this invention relates to tandem engines of the four-stroke ("Beau de Rochas") type, and consists in an arrangement for circulating water through the pistons. For this purpose, the patentee proposes to use a hollow piston-rod, which passes through a stuffing-box at the back-end of the front cylinder. This rod is secured to the two pistons; the hole through its centre being in communication at either end with a water space at the back-end of each piston, similar to that described in patent No. 1711 of 1899.

The second part of the invention relates to the valves and the gear for operating them. They are preferably placed in the back-ends of the cylinders, with their axes parallel to the axis of the cylinders—the exhaust-valve being preferably below, and the admission and gas valves above this axis. To operate the valves, a side-shaft (driven at half the speed of the engine in the usual manner) is used; but, instead of the usual cams, discs are arranged with cam-grooves cut round their circumference. In these grooves work conical rollers on the ends of levers, which, by means of their other ends, operate the valves so as to both open and close them positively, not by springs, as usual. To allow for wear, and for slight errors of adjustment, short springs are interposed in such a manner that, after the valves are on their seats, the lever moves a little further in the direction in which it was moving to close the valve—thus slightly compressing the spring, and pressing the valve firmly on its seat. The movement may be from $\frac{1}{16}$ to $\frac{1}{8}$ inch. The motion thus given to the rollers, being in the direction of the axis of the side-shaft,

and the pressure consequently in this direction also, thrust bearings are provided to take this pressure.

Fig. 1 is a section through the back cylinder and a portion of the front cylinder of a tandem engine. The pistons A and B working in these cylinders are connected by a hollow rod C, passing through a stuffing-box in the back-end of the front cylinder, and forming, by means of the hole through it, a communication between the hollow spaces in the back-ends of the pistons. The arm D, attached to the piston-rod, has fixed to it a hollow plunger or tube E passing through a stuffing-box into the water-space of one cylinder. The arm has a passage formed in it, which is in communication at one end with the

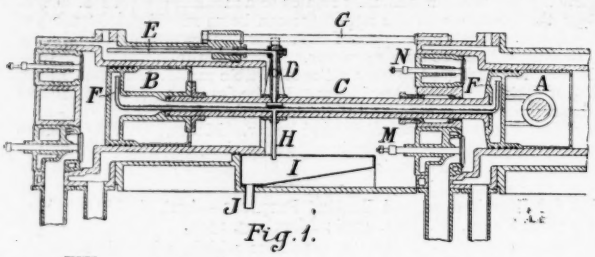


Fig. 1.

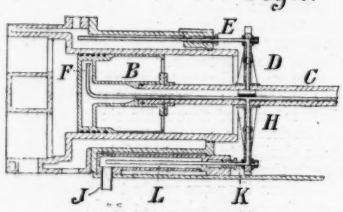


Fig. 2.

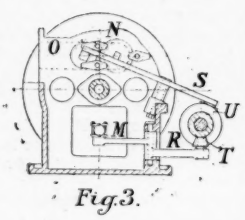


Fig. 3.

hole in the plunger or tube, and at the other with the hole through the piston-rod. A tap-plug in the arm may be used for shutting off the water while the engine is at rest, or for regulating the quantity that passes to the pistons. The arm is guided at its outer end by a guide-bar G. The water passing to the pistons, after filling the hollow spaces in them, overflows into the ends of the pipes F—the inertia of the water making it flow alternately through the front and back pistons. The water that enters the pipe F is allowed to flow away through the tube or arm H to the trough I, provided with a waste-water outlet J.

Fig. 2 shows an alternative method of carrying away the waste water by means of the plunger or tube K working into a space or barrel L, provided with a waste-water outlet-pipe J.

Fig. 3 is a cross section, showing the mode of operating the valves. The exhaust and admission valves M and N open directly into the cylinder, and the gas-valve O into the air-passage. The lever S, operated by a grooved cam and conical roller U, works the admission and gas valves; and a lever R, operated by a grooved cam and conical roller T, works the exhaust-valve. The gas-valve is opened by a knife blade, and closed by a spring in the usual manner; the governor preventing the blade engaging with a notch in the valve-stem when the speed is too high.

Lighting and Extinguishing Street Gas-Lamps at Predetermined Times.—Hook, H., of Pokesdown, near Bournemouth No. 13,139; July 20, 1900.

This invention has for its object to provide means whereby the bye-pass of an incandescent gas-lamp may be automatically turned on and off, or the jet of an ordinary burner be automatically turned up and down.

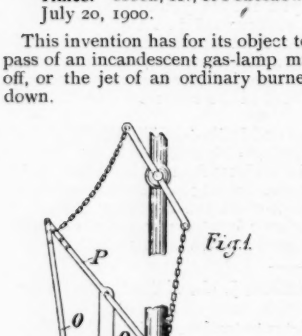


Fig. 1.

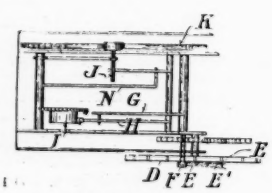


Fig. 2.

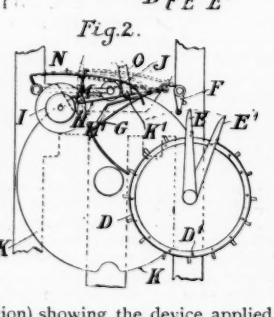


Fig. 1 is a side view (partly in section) showing the device applied to a gas-burner. Fig. 2 shows to an enlarged scale the essential features of the device.

The arrangement consists of ordinary clock-work mechanism (operated by springs), so arranged as to drive through the medium of a train of wheels a wheel D at a uniform rate. This wheel is constructed with any convenient number of teeth—for the purpose of illustration, 16 are shown. It revolves once in twenty-four hours; so one-hour-and-a-half will be occupied by a given tooth in reaching the position originally occupied by the preceding one. Adjustably arranged on the pinion of the wheel are hands E, E^1, provided with pins or projections which take into holes around the wheel, and by this means are carried round with the wheel. The hands are extended beyond the periphery of the wheel, and in their revolution come in contact with a small crank F, causing it to turn and carry upward a bent lever-arm G. This arm carries a pin, which engages with another lever-arm H, pivoted at one end, and having its other end in engagement with a catch on a wheel I, preventing the wheel from revolving. As the arm G raises the arm H out of engagement with the catch, it also raises a second lever-arm H^1 fixed to the same spindle as the other. This second lever-arm in its upward movement comes in contact with a spindle J supported in an arm pivoted to the case-plate, and carrying it and a roller journalled thereon with it. This roller normally lies in a depression M in a revolving disc K. The disc is driven through the medium of a train of wheels by the catch-wheel I—this wheel being driven by a clockwork train actuated by the spring L.

When the arm G has been raised, and in turn has raised the arm H out of engagement with the catch of the wheel I, the latter would revolve, were it not for a pin provided on the wheel, which comes in contact with, and is held by, the bent portion of the arm G in its raised position—as shown by the dotted lines in fig. 2.

After the bent lever-arm has been raised to a certain height, and the lever-arm H^1 has adopted a position above the spindle J, and the roller on the spindle has fallen back into the depression in the periphery of the disc K, it is released, and allowed to fall back again into its original position. This occurs when the hand E has passed clear of the crank F. When the arm G falls, the catch-wheel I is released, and commences to revolve; the arm H being held out of engagement with the catch thereon by the arm H^1 resting on the spindle J. As the catch-wheel revolves, it causes the disc K to revolve also through the medium of the train of wheels already referred to. During the revolution of the disc, it raises (in cam-like fashion) the roller, and its upward movement releases the lever-arm H^1, and consequently the lever-arm H also, and they fall again.

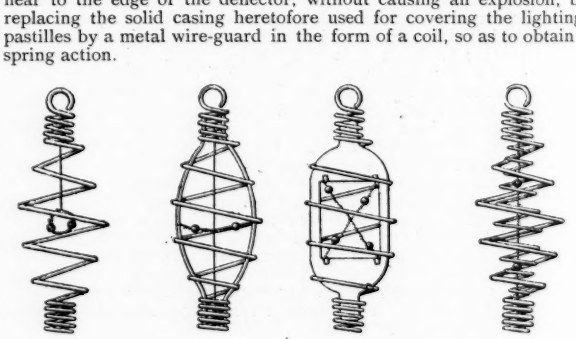
At a convenient point on the disc (preferably adjacent to the depression M), there is pivoted one end of a connecting-rod O, the other end of which is pivoted to a cross-bar P, centrally pivoted to a standard Q, rising from the case-plate of the device. The connecting-rod and the cross-bar are provided with holes, for the purpose of adjustment; while the holes in the cross-bar may also serve for the attachment of the lower ends of chains, the upper ends of which are attached to the ends of a bye-pass or ordinary tap governing the supply of gas to the burner. Thus the revolving of the disc K in the manner described causes the pulling up and down of the cross-piece P, and by means of the chains the turning on or off of the supply of gas to the burner.

Machinery for Discharging Gas-Retorts.—Bronder, G. A., of New York. No. 21,974; Dec. 4, 1900.

The specification of this patent has been used in preparing the illustrated description of the arrangement referred to which appears in our "Technical Record" to-day, p. 618.

Automatic Gas-Lighters.—Berthold, C. E. J., of Berlin. No. 22,226; Dec. 6, 1900.

This invention is designed to prevent the early deterioration of the lighting-pastille under ordinary circumstances, and permits the lighting of burners provided with deflectors, by bringing the lighting-pastille near to the edge of the deflector, without causing an explosion, by replacing the solid casing heretofore used for covering the lighting-pastilles by a metal wire-guard in the form of a coil, so as to obtain a spring action.



Four forms of the lighter are shown—a spiral casing or coil in which the automatic gas-lighting pastille is suspended; a slight modification, in which the spiral casing is stiffened by suitable wires; a frame let into the ends of the spiral casing; and a double coil within which the igniting-pastille is disposed. In the first arrangement, the gas-lighter consists simply of a suitably wound coil, in which the lighting-pastille is suspended. In the second, the spiral casing is stiffened by wires, so that it cannot spring apart. In this case, the lighting-pastille is attached to two opposite parts of the coil or to two opposite parts of the wires. In the third modification, a frame is let into the spiral casing so as to carry the lighting-pastille. By pulling asunder the coil, the frame can be removed from the casing, together with the lighting-pastille, so that the latter can easily be replaced. In the last modification, a second spiral casing or coil is disposed within the other one, to contain the lighting-pastille. This construction also allows of removing the inner coil without difficulty, so as to permit the replacement of the lighting-pastille.

Fitting Pegs to Incandescent Gas-Burners.—Carpenter, C. C., of Old Kent Road, S.E. No. 22,492; Dec. 10, 1900.

This invention relates to an arrangement for fitting the pegs or props used to support the mantles of incandescent gas-burners in such a

manner that the centre or apex of the fork from which the mantle is supported is axially true with the lower or fitting socket of the peg. This is accomplished by taking two or more plates fixed at suitable distances apart; and in the lower one holes or projections are formed in which the socket of the mantle-support can be accurately fitted. Immediately above each hole or projection (and axially true with it), there is made in the upper plate or plates a series of holes through which pass guide-bars carrying on their lower extremities a fork engaging that of the mantle peg or prop. The sockets being placed in position, the prop is dropped in, and the guide-bar allowed to fall until the apex of its fork engages that of the mantle-prop. Cement is then poured into the socket of the prop; and on this setting, no matter how bent the prop may be, the apex of its fork will always be axially true with the lower socket, and therefore maintain the mantle centrally with the burner when in use.

APPLICATIONS FOR LETTERS PATENT.

2873.—Brown, A., "Street gas lighting." Feb. 11.
2875.—Barber, G. H., "Hydraulic main for gas-works." Feb. 11.
2892.—Hildebrand, H., "Heating or cooling gases." Feb. 11.
2922.—King, G., "Closing the mouths of retorts." Feb. 11.
2923.—Aird, K., "Gas fires or stoves." Feb. 11.
2925.—Hoffbauer, F., "Gas-turbines." Feb. 11.
2936.—Scott, W., "Gas-engines." Feb. 11.
2944.—Hendler, J. J., and Reeves, E. K., "Generating acetylene gas." Feb. 11.
3017.—Romocki, J. von, "Incandescent gas-burners." A communication from H. Ascher. Feb. 12.
3038.—Sugg, W. T., "Incandescent gas lighting." Feb. 12.
3070.—Drewry, C. S., "Governor for regulating gas pressure." Feb. 13.
3082.—Neil, A. & J., and Fletcher, Russell, and Co., Ltd., "Gas-stoves." Feb. 13.
3099.—Barrett, F. L., "Charging retorts." Feb. 13.
3118.—Winterflood, J., "Valve attachment for geysers." Feb. 13.
3164-5-6-7.—Hoyle, R., and Wilson, S., "Gas-engines." Feb. 14.
3236.—Dowle, A. G., "Incandescent lamps, burners, and the like." Feb. 14.
3261.—Woodhouse, T. W., "Gas-valve with bye-pass." Feb. 15.
3264.—Blakey, J. W., "Anti-vibrating gas and air burner." Feb. 15.
3266.—Brearley, J. H., "Generator or regenerative furnaces." Feb. 15.
3296.—Boult, A. J., "Burners for incandescent gas lighting." A communication from La Société Lumière Boule. Feb. 15.
3297.—Boult, A. J., "Pressure regulating devices for gas installations." A communication from Société Lumière Boule. Feb. 15.
3341.—Harvey, E. C., "Gas heating appliances." Feb. 15.
3405.—Cater, R. W., "Frame for supporting articles on ordinary gas-brackets." Feb. 16.
3441.—Swallow, L. L., "Gas cooking-stoves." Feb. 18.
3467.—Clarke, A. W., "Gas supply pipes." Feb. 18.
3537.—Owensmith, W. H., "Incandescent gas-burners." Feb. 19.
3571.—Sugg, W. T., and Foulger, G. F. L., "Incandescent gas lighting." Feb. 19.
3573.—Cooke, J. J., and Grosse, G., "Gas-stoves." Feb. 19.
3586.—Darby, J. H., "Manufacture of coke." Feb. 19.
3610.—Goodwin, A., and Hargreaves, W. L., "Engines, pumps, compressors, blowers, exhausters, meters, and the like." Feb. 19.
3689.—Brown, H. E., "Controlling the pressure of gas." Feb. 20.
3728.—M'Donald, R. W., "Ceiling and roof lighting." Feb. 21.
3779.—Scott, E. G., "Manufacture of sulphate of ammonia." Feb. 21.
3805.—Gibbons, W. P., and Teasdale, C. R., "Manufacture of gas." Feb. 22.
3845.—Scott-Snell, C., "Burners for incandescent gas lighting." Feb. 22.
3856.—Leather, J. P., "Determining and recording the illuminating power of gas." Feb. 22.
3874.—Waite, R. T., "Gas and oil stoves." Feb. 23.
3892.—Ritchie, J., "Gas-brackets." Feb. 23.
3934.—Clayton, R., "Gas-fires." Feb. 23.

Middlesbrough and the Darlington New Water Scheme.—The General Purposes Committee of the Middlesbrough Corporation have decided to oppose the proposal of the Darlington Water Board to take more water from the Tees at Broken Scar. The additional pumping-engines proposed to be erected will, it is said, be capable of taking 2 million gallons a day from the river

Public Incandescent Gas Lighting at Birmingham.—The Public Works Committee of the Birmingham Corporation report that 2300 lamps in the city have been provided with means for incandescent lighting, and that a distinct improvement in the lighting of the thoroughfares in which the lamps have been altered has resulted, without, so far as they have been able to ascertain, any additional cost. It is therefore proposed to extend the system to all the principal thoroughfares.

Shipley Gas Bill and Baildon Interests.—One of the Parliamentary Bills of West Riding authorities which affect Bradford is (says the "Bradford Observer") that of the Shipley District Council. The provisions of the measure which specially concern Bradford are those which relate to gas supply, water supply, tramways, and electricity. Having regard to the fact that the incorporation of Baildon within the city is included in the Bradford Bill, and to the fact that, under the Shipley Gas Act, Baildon has to buy Shipley gas, it is a question whether Baildon—or Bradford on its behalf—should not seek, by opposition to the Shipley Bill, to secure the relief of Baildon from this restriction. As to electricity, Shipley asks for powers to supply it to adjoining districts which, unless provided against, would mean to Bradford consumers if they chose to take it. On this and other points Bradford needs protection. It is hoped that all the points may be amicably settled before the Committee stage; but in the meantime a petition to Parliament has been prepared by the Bradford Corporation, not so much with the object of defeating the Bill as with the view of preserving freedom of action, if opposition becomes necessary.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Working Men's Lord's Day Rest Association.

Sir,—I have just received from Mr. Charles Hill, the Secretary of the above Association, a pamphlet headed "The Pearl of Days," a printed circular letter, and a petition form, all of which were addressed to the foreman of the gas-works, and apparently not intended to come to me. But as I hold the office of both foreman and manager, &c., the papers were delivered to me, as is usual in such cases. I herewith enclose the papers for your perusal.

No doubt, similar circulars, &c., have been posted to the majority of gas-works foremen throughout the country; and as, where strained relations already exist between the management and their men, the Association's action may cause further trouble, I think you will agree that the matter should not pass unnoticed. Further, many foremen and men may have received copies of the circular, &c., respecting which the managers will in all probability be in ignorance. The letter asks the foreman to help the Association, and suggests that the "directors and managers may be influenced," &c., and that the "printed memorial should be signed by the men employed in your works and submitted to the Directors."

While agreeing that there should be as little Sunday work as possible, it does seem a pity that the Association should seek to carry out its work in a way which, in my opinion, is quite improper, and which one is almost inclined to qualify as underhand. I have two leading stokers—both right good men, and for whom I have considerable respect; but if either of them presented a petition to me referring to any of the work, or my arrangements, I should at once disrate or discharge him. If there is any complaint to make, I am always willing to hear it from an individual complainant, and in a straightforward way; but by petition, never.

In looking through the constitution of the Association, I find that among the Past-Presidents and Vice-Presidents there are two Past-Presidents of the Trades Union Congress; and the Vice-Presidents include the Miners' Agent for South Wales, and the President of the Miners' Federation of Great Britain. "C. H.," in "The Pearl of Days," writes that "it is possible to lessen the Sunday work, and in some cases to abolish it;" "it is mainly a question of providing more machinery, more retorts, more gas workers;" it is "only a question of expense."

I may mention that I shut down on Sunday for twelve hours whenever that is possible—at this season of the year, every Sunday. But one man must necessarily be at work even when we shut down; and there is always competition for the duty. Only one man, who lives 3½ miles away, has expressed a wish to be "off" on a Sunday; and then four other men offered to take his place. Just at present we are working under very exceptional circumstances; but after about fourteen days, my stokers will be making 25,000 to 30,000 cubic feet of gas per man per day.

W. H. A.

Feb. 28, 1901.

Gas and Water Companies and Electric Traction.

Sir,—Mr. George Livesey's letter in your last issue deserves the attention which any opinion from him on an industrial question demands. I think his contentions may be fairly stated thus: (1) That the London Chamber of Commerce has improperly espoused the cause of one section of its members at the expense of another. (2) That the so-called Joint Committee clause is incompatible with the interests of Gas and Water Companies.

As to the first point, I am not authorized to speak for the London Chamber of Commerce. But I imagine its answer would be that it is willing, under proper conditions, to act as the mouthpiece of any section of its members who desire to call attention to matters which they believe to be prejudicial to their trade interests. It is thus equally open to gas and water companies who are members of the Chamber to do for their interests what the Electrical Section has done.

Turning to the second point, it is clear that Mr. Livesey confirms the charge made in Mr. Murray's letter—that it is the Gas and Water Companies who are the aggressors in this matter, and not the Electric Traction Companies, as was suggested at the recent meeting of the South Metropolitan Gas Company. The former desire to upset the *status quo* reached after the fullest consideration by Parliament.

What justification have they for this? In America, there are some 40,000 miles of electric traction, and probably an equal mileage on the Continent, in operation on the system to which the Gas and Water Companies take exception. Many of these lines have been established for years—certainly long enough to determine whether there is a firm foundation for the fears of the Gas and Water Companies. It is a question of good or bad work. If the work is well done, under the conditions imposed by the Board of Trade, there is no more reason for compelling return conductors for electric traction to be insulated than for forcing gas-mains to be carried overhead, lest by leakage or explosion, consequent upon defective work, injury should be caused to life and property.

The electrical industry in this country has been hampered at every stage by vested interests; and it must be earnestly hoped that the Legislature will not again take a step backward, unless there is more conclusive evidence than at present exists that the fears of the Gas and Water Companies are justified.

R. Percy Sellon,
Chairman, Electrical Section, L. C. of C.

March 1, 1901.

The Price of Dry Gas-Meters.

Sir,—We read with much interest the letter from Messrs. Thomas Glover and Co., Limited, published in your last issue.

Your correspondents contend that no meter manufacturers, other than the old-established firms (who fixed what was, in their opinion, a fair price) are honest; that they cannot supply meters under that

price without a depreciation in the high quality of the meters supplied by these old-established firms; that their guarantee is "no guarantee;" and that they only come into existence to snatch accounts, and drop out.

We are not an old-established firm. We must plead guilty to that charge, and comfort ourselves with the knowledge that, at one time or another, all our competitors suffered from the same disadvantage. We have only been established since 1897; but we have not yet dropped out, nor have we any intention of so doing. We pay the standard rate of wages to our employees, many of whom have been with us since we commenced business. The material used in the construction of our meters is the very best obtainable; and we make a profit on the sale of our goods which we consider a very fair one. We have no doubt but that we are not alone in these respects, and that many of our competitors can say exactly the same.

If Messrs. Glover's opinion of the governing officials of gas companies is that they only want a cheap meter to be offered to them, and accounts may be opened, it is not ours. We have found that, regardless of price, meters were tested on their merits; and any other supposition does not argue very favourably for the intelligence of these officials. We number among our customers some of the largest gas companies in the Kingdom; and it was only after lengthy tests and experiments, that we could get entered on their books as suppliers.

It may be that the price fixed by the old-established firms was one which—owing to costly administration, extensive advertising, and the expense of numerous branches—only left a fair margin of profit; and they are, of course, at liberty to sell their goods at any price they think fit. But we protest most strongly against dishonest motives being ascribed to those who do not agree with them on this point. We (presumably with many other firms) consider we have a right to sell our goods at our own price; and as long as we maintain the high quality of our manufactures, we are sure we will continue to receive the support accorded to us in the past.

LIVERPOOL AND LONDON METER CO., LTD.

Tooley Street, S.E., Feb. 28, 1901.

SIR,—The letter of Messrs. T. Glover and Co., in your last issue, commenting upon the remarks of Mr. Livesey at the meeting of the Crystal Palace District Gas Company, opens out questions of considerable moment to the gas industry. The first and most important is whether it is sufficient to ask of the honest traders that they supply a first-class article at a reasonable price; the second, are gas companies justified in practically freezing-out all new adventurers simply because the honest traders supply good work at a reasonable price?

I am of opinion that the traders are entitled to a fair preference; but there are other vital interests to be taken into consideration. For instance, in the gas-meter industry, no improvements have been made in the principle of their machines since they were first introduced as measures of gas; and I must therefore take it that the energy and talent of the trade have been expended in perfecting the systems of manufacture. Is this the case? I think not; for then we should have no cause for complaints as to want of uniformity of gauge in their manufactures. Let us go a step further, and we find that the only great advance in the meter industry has been the introduction of the prepayment gas-meter. Gas undertakings are in no way indebted to the trade on that account. The system was first of all introduced by an outside adventurer—one in no way interested in the meter trade (Mr. Brownhill). His meter was perhaps impracticable; but the idea was taken up, perfected, and introduced by the very class now considered good for freezing-out. Mr. Livesey and the gas companies may, therefore, fairly consider that they are justified in giving encouragement to outsiders.

The "JOURNAL" has frequently called the attention of gas managers to the fact that they of the rising generation must face a new order of things. Twenty years ago, gas companies feared no foes; they were practically free of competition. A change then came upon the scene. Electricians made a vigorous attack upon the monopoly by gas authorities of the public lighting. They followed it up with an assault on private lighting, and secured positions from which at present there appears small probability of their being easily ousted. The Americans and the Russians then invaded gas territory—supplying illuminating oils at unprecedented rates. This competition favoured progress. The gas manufacturers were compelled to search out for new fields to supply. They held out the hand of assistance where hitherto it had been refused; and as a consequence we find that the introduction of competition in lighting gave an immense impetus to the introduction of gas for purposes other than lighting. Gas-engines and gas-stoves consumed gas previously used for public lighting; and the immense demand from artizans' dwellings enabled gas companies to do more than hold their own.

Have the gas authorities considered these results sufficient? I venture to say that they have not; for they commenced to set their houses in order. New systems of carbonizing, resulting in great saving of fuel, labour-saving appliances in the form of conveyors, and machine charging and improved methods of utilizing residuals, have enabled them to make and sell their gas at greatly reduced cost. Much more remains to be done; and I am at one with Messrs. Glover in considering that it would be mutually advantageous to gas managers and manufacturers and experts in gas apparatus to hold periodical meetings for comparison of notes.

The most noticeable feature of the New Century, from an industrial point of view, is the tendency of manufacturers to join forces, either by amalgamation or by the formation of Associations. This must, of necessity, give rise to feelings of suspicion on the part of their customers, as to what may be the objects aimed at. They may be of the most selfish description, or they may have a tendency to the general good. From an engineering point of view, the amalgamation of the various firms of an industry gives first a large and constant turn-out, complete sub-division of the work is possible, and labour-saving devices can be adopted that are impossible in works of smaller magnitude. This is a subject worthy of the consideration of any such new Association. The gas managers could bargain for their undertakings having a fair share in the savings resulting from these combinations. It is reasonable that the firms should be asked, after paying a legitimate interest on the capital invested, to divide the remaining proportion of profit in moieties—one to the firm and the other to be distributed among the customers of the firm in the shape of a half-yearly rebate on the amount of their accounts. The workpeople should also share in the profit, and receive a proportion of the rebate.

The coming decade will bring a fresh and vigorous campaign against the gas companies; and it will have to be met with New Century ideas. Gas manufacturers and plant manufacturers alike will have to strain every effort to obtain efficiency at reduced cost. Cheap gas will have to be made; old-fashioned prejudices will have to be removed; and legislators and the general public will have to be educated up to the point of knowing that restrictive Acts of Parliament will have to be altered. Then will gas companies be enabled to tackle the question of supplying cheap power and smokeless fuel where now out of their reach. For these purposes a Joint Association would be invaluable.

Manchester, March 2, 1901. THOS. G. MARSH.

Experiment in Reducing Illuminating Power.

SIR,—Having the management of a company who have, I believe, always supplied gas of not less than 17½-candle power, and charging their maximum price, which is much lower now than our neighbours, who supply 15 to 16 candle gas (the result of giving way to prevent opposition from the council when applying for their Provisional Order), the high price of coal naturally pointed to a great reduction in profit. Although having at the time been appointed here only a short while, I recommended my board to reduce the illuminating power to 16 candles, as the working results were seriously affected in the effort to keep the gas up to the standard hitherto supplied, with coal of not quite such good quality. As a fact, although equal contracts for inland and seaborne coal had been running, it fell to my lot to have a greater stock of the latter. Unfortunately, I was not nearly so lucky as in the case of your correspondent.

Notwithstanding that I reduced the quality of the gas very gently, complaints that "the gas was not so white as it used to be" dropped in; and encouraging my stokers with our improved working resulted on one occasion in the night men (in order to compete with the day men) putting the light down to just under 15 candles in the early part of the evening—making matters in my case very unpleasant. I made an effort to go personally to all who sent letters of complaint; and although in some cases—apart from the reduction in quality—small pipes were the cause, I discovered that defective burners were at the bottom of most of the trouble. I have supplied burners and economizers free for months past; and both myself and my foreman have made every inquiry, and attended to complaints even when made indirect. In the case of shops and other buildings, we have recommended incandescents or fitted burners and economizers free, at a most trifling cost to the company.

I am now more than satisfied with the results. We are supplying gas of between 15·5 and 16 candle power; and for weeks past we have not had a single complaint. But the principal point is the saving under the heading of carbonizing, which I find will work out to a substantial sum at the end of the year. The consumers, too, will eventually benefit, as with the reduction in the price of coal and the illuminating power also, we hope at an early date to be able to lower our price for gas.

The experiment in reducing illuminating power—though somewhat difficult—has, in my case, been quite successful. S.

March 1, 1901.

Conveying Gasoline by Sea in Tropical Climates.—"H. K. H." writes that he will be glad of information on the two following points: (1) How to convey gasoline in quantity by sea in a tropical climate, without risk of loss or damage; and (2) what firms are prepared to purchase the dried cyanide residue resulting from washing gas with a solution of sulphate of iron. The first question is eminently fitted to be dealt with in our "Correspondence" columns; but as to the latter, private letters only (addressed to the "JOURNAL" office) could be attended to—and this only in view of the fact that our correspondent is the Engineer of a Gas Company in the Far East, and so has not the ordinary facilities for getting such information at first hand.

Midland Association Meeting.—Mr. Charles Hunt writes: A correction is necessary in your report of my remarks in seconding a vote of thanks to the President for his address. I am made to say that the adoption of coke-ovens by gas manufacturers would not do more than "instigate" (instead of "mitigate") competition in the sales of residuals. Mr. Samuel Glover, of St. Helens, writes: I notice by an error in the report of the discussion on Mr. Berridge's paper at the recent Midland Association meeting, you make it appear that I said, after the words "gas managers made in Germany," "who would be sent over to teach English gas managers how to make gas out of distilled tar," instead of "how to make gas, how to distil tar," &c. I have no doubt that many of your readers will see at once the error; but I shall be glad if you will publish this correction.

Mr. Pete Curran on English and American Workmen.—When on his way, a few days ago, to address the Penrhyn quarrymen, Mr. Pete Curran called at Neath, and spoke at a meeting organized by the Neath Trades Council in the interests of the local gas stokers. He has lately been travelling in America, and he saw there a great deal which impressed him. In the course of his remarks, he told his audience that the lot of the worker in the old country was far better than that of the cosmopolitan herd of workers across the Atlantic. The rush and the wear and tear in America he described as fearful; and at the end of the week, after working at such high tension, the money earned, taking its purchasing power into consideration, was little more than that obtained by the British workman. The American worked 60 hours a week; and it should not be forgotten, he said, that he worked 60 minutes in the hour. The grinding, crushing tyranny of the Trusts and the Syndicates was described in a masterly manner, as was also the corruption in elections and public matters generally. He said he hoped they should never see the workmen of this country toiling under the degrading and exhausting conditions which were so painfully apparent in America. The spread of Trade Unionism would prove a great blessing to English and Americans alike.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress has been made with Bills:—

Bills read the first time: Arlesey Gas Bill, Aspatria, Silloth, and District Water Bill, Barrow-in-Furness Corporation Bill, Broadstairs and St. Peter's Water and Improvement Bill, Dover Corporation Bill, Handsworth Urban District Council Bill, Harrogate Water Bill, Heywood and Middleton Water Board Bill, Leeds Corporation (General Powers) Bill, Leeds Corporation Water Bill, Oakham Water Bill, Poulton-le-Fylde Gas Bill, Prestatyn Water Bill, Ripon Corporation Bill, Rugby Water and Improvement Bill, Salford Corporation Bill, Sheffield Corporation Bill, Smethwick Corporation Bill, Southport Water (Transfer) Bill, Stockport Corporation Water Bill, Stratton and Bude Gas Bill, Stratton and Bude Improvement Bill, Sutton-in-Ashfield Urban District (Water) Bill.

Bills read the first time and referred to the Examiners: Alfreton Gas Bill, Bath Gaslight and Coke Bill, Chester Gas Bill, Dover Gas Bill, Elland Gas Bill, Faversham Water Bill, Harpenden District Gas Bill, Newcastle-upon-Tyne and Gateshead Gas Bill, Newport (Isle of Wight) Gas Bill, New Swindon Gas Bill, Omagh Gas Bill, Otley Gas Bill, Rhymney and Aber Valleys Gas and Water Bill, Shrewsbury Gas Bill, South Essex Water Bill, Weston-super-Mare Gas Bill, Wisbech Water Bill.

Bills read a second time: Arlesey Gas Bill, Aspatria, Silloth, and District Water Bill, Barrow-in-Furness Corporation Bill, Broadstairs and St. Peter's Water and Improvement Bill, Dover Corporation Bill, Handsworth Urban District Council Bill, Harrogate Water Bill, Heywood and Middleton Water Board Bill, Leeds Corporation (General Powers) Bill, Leeds Corporation Water Bill, Oakham Water Bill, Poulton-le-Fylde Gas Bill, Prestatyn Water Bill, Ripon Corporation Bill, Rugby Water and Improvement Bill, Salford Corporation Bill, Sheffield Corporation Bill, Smethwick Corporation Bill, Southport Water (Transfer) Bill, Stockport Corporation Water Bill, Stratton and Bude Improvement Bill.

HOUSE OF COMMONS.

Sir Henry Fowler intends to ask the First Commissioner of Works to-night whether he can improve the system of lighting the inside of Palace Yard in the same manner as that adopted on the frontages to Parliament Square and Bridge Street—viz., by incandescent lamps.

Mr. Bousfield has given notice of his intention to bring in a Bill to amend the law relating to Weights and Measures; and Mr. Sinclair proposes to introduce one to amend the law relating to the liability of water companies for the storage of water.

Last Friday, a Bill to amend the Borough Funds Act, 1872, was brought in by Captain Jessel, and read the first time.

Mr. Bartley gave notice last week of his intention to move for a return showing the results of the expenditure on the supply of electricity by local authorities in Great Britain and Ireland, furnishing the following particulars: (1) Locality. (2) When authority for the supply of electricity was granted. (3) Capital expended. (4) Gross revenue. (5) Estimated value of electricity used by locality. (6) Total actual revenue. (7) Total annual expenditure of maintenance, manufacture, and all other charges, not including sinking fund or interest on capital expenditure. (8) Net revenue or net annual loss. (9) Percentage of profit or loss on capital expended.

Sir F. Dixon-Hartland has blocked the London Water (Purchase) Bill and the Rickmansworth and Uxbridge Valley Water Bill; and a similar step has been taken in regard to the latter Bill by Mr. Grenfell. The Wolverhampton Corporation Water Bill has been blocked by several members.

The Essex County Council have petitioned against the London Water (Purchase) Bill; the Cullingworth Gas Company, against the Bingley Urban District Council Bill; and the Heckmondwike Gas Company, against the Heckmondwike Gas (Transfer) Bill.

The following progress has been made with Bills:—

Bills read the first time, and referred to the Examiners: Aldershot Gas and Water Bill, British Gaslight Company Bill, Burgess Hill Water Bill, Crawley Gas Bill, Cromer Water Bill, Devonport Gas and Coke Bill, Dorking Gas Bill, Gaslight and Coke Company Bill, Golborne Gas Bill, Gravesend Gas Bill, Horley District Gas Bill, Leatherhead Gas Bill, Llandrindod Wells Water Bill, Long Eaton Gas Bill, Richmond Gas Bill, Rickmansworth and Uxbridge Valley Water Bill, South Metropolitan Gas Bill, Stroud Gas Bill, Tendring Hundred Water Bill, Wells Water Bill, West Surrey Water Bill.

Bills read the first time, and ordered for second reading: Aldeburgh Corporation (Water) Bill, Bingley Urban District Council Bill, Blackburn Corporation Bill, Burton-upon-Trent Corporation Bill, Bury Corporation Bill, Colwyn Bay and Colwyn Urban District Gas Bill, Derby Corporation Bill, Derwent Valley Water Board Bill, Devonport Corporation (Gas) Bill, Hartlepools Gas and Water Transfer Bill, Heckmondwike Gas (Transfer) Bill, Honley Urban District Council Gas Bill, Ilkeston and Heanor Water Board Bill, Kettering Urban District Water Bill, Kingston-upon-Hull Corporation Bill, Llandrindod Wells Urban District Council Water Bill, London Water (Purchase) Bill, Mansfield Corporation Bill, Metropolitan Water Companies (Amendment of Acts) Bill, Mond Gas Bill, Petersfield and Selsey Gas Bill, Rhyl Improvement Bill, Shipley Improvement Bill, Swanage Gas and Water Bill, Tees Valley Water Board Bill, Wallasey Improvement Bill, Wells Corporation Water Bill, Wolverhampton Corporation Water Bill.

LEGAL INTELLIGENCE.

BRISTOL WINTER ASSIZES.—Saturday, Feb. 23.

(*Before Mr. Justice* DAY.)

White v. Bristol Gas Company—Damages for Personal Injuries and Loss Occasioned by a Gas Explosion.

In this case the plaintiffs were John White, Augusta White (his wife), and Arthur White (their son); and they sought to recover from the Bristol Gas Company damages for personal injuries and loss sustained by the alleged negligence of the defendants. Negligence was denied by the latter; and as to two of the plaintiffs, they alleged contributory negligence.

Mr. J. ALDERSON FOOTE, K.C., and Mr. CLAVELL SALTER appeared for the plaintiffs; Mr. HENRY E. DUKE, K.C., M.P., and Mr. F. E. WEATHERLY for the defendants.

Mr. FOOTE, in opening the case, said the action was to recover damages for severe personal injuries sustained in consequence of an explosion of gas at the Ship Inn, Deanery Road, on Nov. 25, 1899. Mr. White was the licensee of the Ship Inn. In the summer of 1899 the Tramway Company dug a trench in Deanery Road for their electric cable; and the trench remained open some weeks or months, also exposing the gas-main. This action was not now against the Tramway Company, but solely against the Gas Company. Therefore in anything he said he was not complaining of the Tramway Company. It was important to consider the duty of the Gas Company when their mains were exposed to danger by work in the streets. They were bound to take all reasonable precautions to see that the mains were not injured, because they contained that which was dangerous to the public if it escaped improperly. In October, the trench was loosely filled in by the Tramway Company; and when it was done, he thought the Jury would find, the Gas Company made no inspection or test of their main, although they knew of the trench being dug and that the main was exposed for, at any rate, some weeks. The road at this part was composed largely of rubble and the remains of old buildings; and it appeared probable that, in filling up the trench, the gas-main was not properly supported underneath. A steam-roller went over the trench towards the end of October. Then early in November a strong smell of gas was noticed in the street, and continued for two or three weeks. At last it became so intolerable that Mr. White sent for a gas-fitter to examine his fittings. They were found all right; but the smell was strongest in the bottle and jug department. The gas-fitter removed the flooring at about six o'clock in the evening to see if there were any pipes underneath. There were no pipes; but instantly a volume of gas rushed up into the department, where there was a light, and a serious explosion occurred. Mrs. White, who was in the bar, was so seriously burnt that at one time her life was in danger. The son, who worked at his own trade, was less seriously hurt. Whether the gas had begun to accumulate under the floor from the previous July, he did not know. Probably when the steam-roller was used, the main was fractured, because it had not been properly supported; and so the gas escaped. Up to the time of the explosion, Mrs. White had enjoyed good health and managed the house. Since then she had not been able to do so; and her husband had had to give up his work as a clicker, and stay at home.

John White, who was in another part of the house when the explosion occurred, confirmed the statement of Counsel.

In cross-examination, witness said that he had abandoned his action against the Tramway Company, but not because he was told that they closed the trench on July 22. He did not think the Corporation steam-roller went over the trench which exposed the gas-main. He noticed the gas escaping in the street in September, but said nothing to the Company. The smell of gas was perceived in his house three or four days before he called in a gas-fitter. He did not tell anybody that the gas-fitter used a light, and said, "It's all right," and then the explosion occurred. The fitter tested the chandelier in the sitting-room within a few minutes of the explosion; but he blew out the candle he was using before going to the bottle and jug department.

Re-examined by Mr. FOOTE: There was no candle used in the bottle and jug department; and there was no need for one, as there was a bright incandescent light.

The other two plaintiffs also gave evidence.

George B. Baynton, the gas-fitter who was engaged to find the leakage, said he used a candle to solder pipes that he cut. But he finally blew it out when he could find no escape. He then proposed to take up the boards of the bottle and jug department, and did so without using or requiring the candle, because there were incandescent gas-burners alight. Almost as soon as he got one board up, and before the street door could be opened, the explosion occurred.

Other witnesses having given evidence,

Mr. *A. P. I. Cotterell*, Surveyor, stated that he had examined the premises, and opened the pavement between the gas-main and the house. The road was "made-ground"—rubble and lime, &c., from old buildings. The wall of the house had holes in it, and there was an old drain, so that a leakage of gas could get into the house, and the nature of the road would allow gas to escape in several directions.

Mr. *J. M. Froud*, Surveyor, corroborated this evidence.

Mr. *W. H. Passmore*, M.R.C.S., explained Mrs. White's injuries, and said even in February, 1900, she was unable to attend to her duties.

Dr. *Carter* said Mrs. White could never be as well as she was before the shock. She had fallen faint in the street since, and sprained her ankle.

Mr. DUKE, on behalf of the Company, remarked that there were two allegations of negligence—neglect to secure the main, and, if not that, neglect to stop an escape of gas. The Tramway Company cut a cable trench parallel to the gas-main—which never was exposed at the point—and the Gas Company supervised the work in their own interests, watching the security of their main. With regard to the undoubted fracture of the main and escape of gas which occurred without the

knowledge or the fault of the Gas Company, the only person who took any action was the plaintiff, John White, who came to the conclusion that there was an escape of gas in his own house. None of those who said they smelt gas in the street took steps to tell the Company; and the Company's officials who passed daily did not observe the escape. In fact, nobody discovered it until the explosion occurred. The conduct of the plaintiffs' witnesses at the time was a better indication of the facts than their evidence nearly two years afterwards. There was undoubtedly an escape of gas into the plaintiffs' house; and there was an explosion. He suggested that it was caused by young White holding a candle while Baynton was getting up the boards.

George Kingom, inspector of outside work for the Company, said he inspected the work of the Tramway Company daily; and sometimes two or three times a day. No part of the gas-main was exposed. When the fracture was found, no portion of the main was in newly-disturbed ground. They had to use picks to get at the main.

Cross-examined: He could not say how the main was fractured; but he knew that steam-rollers often fractured mains.

Re-examined: A pickaxe blow would not cause such a fracture as this one.

Monday, Feb. 25.

On the case being resumed this morning,

Sidney C. Holmes, an excavator, corroborated the statement that the ground around the fractured main was solid, and had not been disturbed recently.

Cross-examined: He never saw the main exposed while the tramway trench was open.

James Jones, one of the Company's labourers, gave similar evidence.

Mr. *R. L. Griffin*, Electrical Engineer, who superintended the cutting of the tramway trench, said the gas-main was not exposed at any time during the work. The tramway cables were put in four pipes, which were embedded in concrete.

Three other witnesses who were engaged in laying the pipes for the cables also deposed that the main was never exposed.

Mr. *Albert Jones*, the Company's Superintendent of Mains, said he watched the tramway work in Deanery Road, and the gas-main was never exposed in the neighbourhood of the Ship Inn. When the escape of gas occurred, the ground was quite firm. John White told him that Baynton, the gas-fitter, had a light when the explosion occurred, and added, "I was afraid something would happen when he asked for a light."

Cross-examined: Plaintiff did not at the time blame the Gas Company, but took the blame upon himself. Naturally White was upset by the explosion. He (witness) understood that Baynton was a customer, and was to be paid personally for his work, as it was done in his own time. No complaints of smells in the road had been made to the Company. He had 323 miles of mains under his supervision.

Police-Inspector *Robertson* stated that immediately after the explosion he went to the Ship Inn, and White told him that his son held a light while Baynton took up the boards, and then the explosion occurred. Witness had been in the road daily for a month before, and noticed no escape of gas. The police had instructions to report escapes of gas.

A police-sergeant corroborated this evidence, and a police-constable stated that Arthur White told him at the Infirmary that Baynton was holding the lighted candle, but Baynton said Arthur White had the candle. The landlord afterwards said his son was holding the light. This witness passed the Ship Inn eight or nine times daily for a month before the explosion, and did not smell gas in the road

Mr. *John Phillips*, the Secretary of the Gas Company, said he was almost daily passing along Deanery Road while the tramway trench was being made; and the gas-main was not exposed. He was frequently along the road in November, and did not smell gas.

Similar evidence was given by other gas officials.

Mr. *D. Irving*, the Engineer of the Stapleton works of the Company, said the fractured main was a good, sound article, and properly laid. A fracture of the kind could not have been produced by the blow of a pick. He thought the accident at the Ship Inn was a local explosion near the floor, caused by the application of a light. If the room had been filled with gas mixed with air, the whole building would have been wrecked.

Cross-examined: A very slight explosion would blow windows out. He thought the main must have been fractured some time after the trench was made. The gas would take some time to come through the surface of the macadamized road.

Mr. *George Ford*, District Inspector to the Sanitary Authority, stated that the steam-roller, weighing 15 tons, was put on Deanery Road from about Oct. 6 to 11. It also passed by the Ship Inn as late as the 18th.

Counsel having addressed the Jury,

His Lordship summed up, remarking that there was not a scintilla of evidence of contributory negligence against White and his wife. It was for the Jury to say whether, seeing that no gas was known to be under the floor, there was contributory negligence against Arthur White, if they believed that he was holding a light. The explosion was undoubtedly connected with the fracture of the main? How did the fracture occur? It seemed conclusive that the main had been disturbed by the construction of the cable trench, though there was no imputation against the manner in which the trench was made In made-soil of the character that this was, the making of the trench was very likely to disturb the main, though it might not have been exposed. But, being disturbed, when a great weight like the steam-roller came over it, one could easily understand the fracture of the main. The Gas Company did not appear to have done more than ascertain that the main was not exposed; but it was disturbance, not exposure, that they had to dread.

The Jury found for plaintiffs, and awarded them £420 damages—£400 for the husband and wife and £20 for the son.

On Thursday, leave to appeal—on the question of the liability of the Company for the explosion—was granted on the application of Mr. Duke.

Canadian Gas-Works.—According to some statistics published in the "Electrical World" of New York, there has been a decrease of six gas-works in Canada during the past ten years; the number in 1891 being 49, whereas last year it was only 43.

BRISTOL WINTER ASSIZES—Monday, Feb. 25.

(*Before Mr. Justice* Day.)

The Bristol Gas Company Lose an Action for Libel.

Following the action connected with the Ship Inn gas explosion was one by the Bristol Gas Company against Mr. W. D. L. Macpherson, of Clifton, for libel. Defendant denied the libel, and said the words used were true in substance and fact, and were made as a *bonâ-fide* comment.

Dr. Blake Odgers, K.C., and Mr. F. E. Weatherley appeared for the plaintiffs; Mr. J. Alderson Foote, K.C., and Mr. F. R. Y. Radcliffe for the defendant.

Dr. Blake Odgers, in opening, said the Company complained of a letter which defendant wrote, and which appeared in the "Bristol Times and Mirror" on Sept. 17 last, charging the Company with abusing their powers and sending one of their inspectors to see a gas-fitter and get him to tell a lie. Defendant had a five-light meter; and he wanted a ten-light one substituted in December, 1899. A new meter was accordingly sent on Dec. 15, and was fixed by defendant's fitter on the 16th. But the Company did not know of it; and just before Christmas a man went to fetch the old meter, and was told by the servant that the new one was not fixed. No doubt that was only a mistake. On Jan. 11 a man went to read the meter; and a bill was sent in on that reading without reference to the gas consumed through the old meter, which was in the back garden, and was not returned to the Company until Jan. 12. The old meter showed a consumption of 21,500 cubic feet; and the Company assumed that the new one was fixed on Jan. 11. The bill, however, went in on Jan. 4 for the December quarter, charging for 21,500 feet too little gas. When the next bill—for the March quarter—went in, the Company charged for the 21,500 feet consumed in the previous quarter. Mr. Macpherson objected, and said he held a receipt in full discharge of the December quarter, and was not going behind that receipt. The Company had wrongly assumed that the new meter was fixed in January; and their inspector went to see the defendant's gas-fitter, and was satisfied that the meter was fixed in December. The Company, however, pointed out that this fact did not affect the amount of gas consumed; but the defendant refused to pay until he went to an eminent firm of solicitors, when the account was paid in full. But as defendant had said he was not going to pay, the gas was cut off; the man having been sent to do it before the money was paid. Then the gas was restored without charging the defendant for making the connection. Nothing more occurred until Sept. 17, when the following letter appeared in the "Bristol Times and Mirror":—

The Bristol Gas Company and its Methods.

Sir,—On receiving from the Gas Company a demand of unprecedented amount for gas supplied to my house for the quarter ending March 31 last, I found by my own data that it was considerably in excess of the amount I had consumed during the quarter, and appeared to be some supplementary charge for the previous quarter, to which I objected, as I had the collector's discharge in full for that quarter, ending Dec. 31. The Company contended that the gas was supplied since that date, and actually sent an inspector to my gas-fitter to endeavour to press him into saying that the meter upon which they were charging was put on in January instead of December. He, as well as I, proved that they were wrong; and they then sent in a claim in a new form, stating the sum I paid in December as a payment on account. They further threatened me with "proceedings," and the cutting off of my gas. I then placed the matter in the hands of a solicitor, who at once communicated with them; and he shortly afterwards paid their demands in full. But while it was in his hands, and in course of settlement, they actually sent up and cut off the gas from my house—a proceeding which could in no way help the settlement, though calculated to inflict unnecessary annoyance and inconvenience upon me, and was all the more inexcusable as I had paid their accounts regularly for nineteen years, had offered them a cheque for the gas actually consumed during the March quarter (about £9), and the difference between us was only one of some £3. Further, if any additional claim could be sustained against me, it was wholly owing to their own mistake. As this little story shows how the Gas Company use—or abuse—the enormous powers given to them, I think I am only doing a service to my fellow citizens in bringing their conduct to the light of public opinion.—I am, &c.

Counsel asked the Jury to say there was no excuse for attacking the Gas Company in one of the leading local papers.

Mr. *John Phillips*, Secretary to the Company, said he should not have been fit to hold his position if he had suggested that the defendant's gas-fitter should be pressed to say that the meter was not fixed until January.

Cross-examined: No doubt Mr. Macpherson would have paid the right amount if it had been charged for December. The Company were bringing this action because a charge was made against them, and they wanted to clear themselves. The inspector who went to see Smith, the gasfitter, merely went to make inquiries. Mr. Cross, the defendant's solicitor, asked him by telephone not to cut the gas off, and he would pay. But the man had gone to do it, and as defendant had said he would not pay in full, and the negotiations had been on so long, he thought it was time the matter should be terminated. Notice was given to the defendant. A letter was written to the Board, but the matter was then out of witness's hands. The Board would have accepted an apology.

Alfred Maby, chief inspector of meters, said the men reported two or three times, on the authority of the servants, that the new meter had not been fixed. He went to see the gas-fitter at the defendant's invitation, and saw his assistant, who showed him the day-book, indicating that the work was done in December. He went away still thinking there had been a mistake.

Fred. Hillier deposed that defendant's servant told him two or three times that the meter had not been changed. Ultimately he found the old meter in defendant's back garden.

Other evidence having been given in support of plaintiffs' case,

Mr. Foote addressed the Jury for defendant. He remarked that this was one of the silliest, most impertinent, and groundless actions that any Company had ever brought. A libel must be something that brought hatred, ridicule, or contempt upon the libelled. All the letter meant was that the Company were high-handed, made mistakes, and injured their customers by their recklessness. They had made a mistake, and were high-handed in cutting off the gas of a respectable gentleman after the promise of his solicitor to pay what was right; and

the publication of the letter evidently made them ashamed, for they re-connected the gas afterwards. He asked the Jury to say that the bringing of the action was a waste of the shareholders' money.

His LORDSHIP, addressing the Jury, said this was a strange action by a highly-respectable Company, who at the outset were entirely in the wrong. But instead of clearing up the matter, they relegated it to officers, and began writing letters in a case of a gentleman with whom they had had no trouble for nineteen years. Then, when he put the matter of dispute into the hands of his solicitors, they took advantage of the opportunity to cut off his gas. Looking through the letter as a reasonable being, he could find no libel in it at all; and it was very harmless. It did not attack the personal character of the Company nor their gas; but the wretched dispute was set out, and truly set out. If Mr. Macpherson had been bringing an action against the Company he could have understood it.

The Jury returned a verdict for defendant.

Embezzlement from the Warwick Gas Company.

Last Friday, the Warwick Borough Magistrates had before them a charge for embezzlement—to the extent, it was stated by Mr. W. T. Tew, the Secretary and Manager, of some £203—preferred against a young man in their employ, named W. J. Gee, one of their assistant clerks. The fraud was committed by using the counterfoils of some of the receipt-books for entering comparatively small amounts in place of larger sums paid by consumers, and carrying forward as "arrears" the amounts really paid. The prisoner, who pleaded "guilty," was, in consideration of his previous good character, sentenced to only three months' imprisonment in the first division.

Another Theft from a Prepayment Meter.

Before the Croydon Borough Bench (Mr. T. W. Dobson in the chair), on the 22nd ult., Leo Badger, 18, and Robert Bailey, 16, were charged together with stealing between the 31st of January and the 16th ult., from an automatic gas-meter at No. 9, Virginia Terrace, Spa Road, 2s. 7d. in bronze, the property of the Crystal Palace District Gas Company. Edward Mercer, collector to the Company, said that on the 28th of January he called at the house in question, and the meter was then in order, but did not contain any money. Thomas Vardell said he went to the house on the 16th of February, and found the meter broken open, the lock having been wrenched off. There should have been 2s. 7d. in the meter, but it was empty. Mary Drakard, of 7, Virginia Terrace, said that on the 14th of February, she saw two lads leaving No. 9, and gave information to the police at once. She could not identify the prisoners. Detective-Sergeant Easter said he arrested Badger on the previous day. He said: "I'm very sorry; I should not have done it if I had not been hard up." Detective Allerton proved the arrest of Bailey, who said: "Badger opened the front door with a key, and got a dresser drawer to stand on." The Bench sentenced them each to fourteen days' hard labour, and told them the offence was due to their idle, lazy, loafing habits.

Hard Labour for Stealing from a Coin Meter.

At the Liverpool County Sessions last Tuesday, Patrick Riley, was charged with having stolen 2s. 2d., belonging to the Mayor, Aldermen, and Burgesses of the borough of Leigh. The prisoner was living in a common lodging-house, and broke open a slot gas-meter and took out 2s. 2d. which it contained. Prisoner also admitted a previous conviction in July, 1900. The Magistrates said that his record was a bad one, and gave him six months' imprisonment, with hard labour.

The Charge of Embezzlement Against a Gas Collector.

At the Southwark Police Court last Wednesday, before Mr. Slade, Francis Anthony, a collector in the service of the South Metropolitan Gas Company, was charged, on remand, with embezzling various sums of money, amounting in all to £1 0s. 6d., the property of his employers. The earlier proceedings were reported last week (p. 546). Mr. Pasmore prosecuted; Mr. Sydney appeared for the accused. It may be remembered that it was prisoner's duty to collect the money from automatic gas-meters and to enter in his book the registration of the index. It was alleged that he had understated the amount of gas consumed in many instances, and had thus been enabled to appropriate part of the money taken from the meters. These alleged deficiencies were found by a "surprise" inspector in George Row and Flockton Street, Bermondsey; and it was stated that inquiries on the prisoner's round, extending over three days, revealed a total deficiency of £23. Ernest Holden, the inspector in question, who gave evidence at the first hearing, was cross-examined by Mr. Sydney. He said that about 5 per cent. of the automatic gas-meters went wrong. If there were not sufficient pence in the receptacle for the quantity of gas consumed according to the index, the collector was authorized to take the balance from the consumer by instalments. He had known a case where gas had passed through the meter and been registered on the index when no money had fallen into the receptacle. All the meters did not register 27 cubic feet for a penny; there were some which only registered 25 cubic feet. So part of the money was returned to the consumer on each collection. These were old meters which were sent out when gas was dearer, and had not since been altered. In re-examination, witness stated that when a collector found a meter wrong he reported the matter, and a fitter was sent. If the register were found to be defective, the fitter would label the meter "D.R.," meaning "defective register," and it would be exchanged. The letters "D.R." did not appear on any of the 43 alleged deficient meters in George Row and Flockton Street. Detective-sergeant Vanstone stated that when the charge was explained to the prisoner, after his arrest, he said: "I admit the registers were wrong, but I did not have a penny of anyone's money. I did wrong; I should have reported it." The prisoner pleaded "Not guilty," and was committed for trial.

MISCELLANEOUS NEWS.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

At the annual meeting of the Altrincham Gas Company last Tuesday, the net revenue from the sale of gas last year was shown by the accounts to have been £20,101; the quantity sold having been 144,707,637 cubic feet, or 13,303,161 cubic feet more than in 1899. The total receipts were £27,578; and the expenses, £18,823, coals costing £11,337, or £2214 more than in the previous year. Notwithstanding this, the profit was £8755, against £7964 in 1899—an increase of £791—though no advance was made in the charge for gas. This fact reflects much credit upon the Manager (Mr. J. E. Lamb). The full statutory dividends were declared, and £826 was carried forward.

At the meeting of the Brighton and Hove Gas Company next Friday, the accounts to be presented for the six months ending Dec. 31 show the effect of the great advance which has taken place in the cost of coal and other materials. The increased price of gas and the improved value of coke have not met the greater cost of production. The sale of gas shows a slight decrease in comparison with the corresponding period of 1899. Altogether, 525,378,000 cubic feet were sold, producing a revenue of £86,499; the rental of meters, fittings, and stoves amounted to £5643; the sale of residuals produced £20,261; and the total receipts were £112,573. The manufacture of gas came to £72,649 (coals, coke, and oil figuring for £53,622); distribution cost £9863; and management, £4108. The total expenses were £91,699; leaving a balance of £20,874 to go to the profit and loss account. The balance to the credit of this account is £24,630; and the Directors will recommend dividends for the half year at the rates of 10 and 7 per cent. per annum on the original and "A" consolidated stock, and 6 and 4 per cent. per annum on the "B" and "C" preference stocks. For the payment of these dividends £20,621 will be required; leaving a balance of £4009 to be carried forward. Under the supervision of Mr. Joseph Cash, M.Inst.C.E., 35,177 tons of coal and 649,760 gallons of enriching oils were used in the half year; the estimated quantities of residual products being: Coke, 21,491 tons; breeze, 1799 tons; tar, 516,655 gallons; and ammoniacal liquor, 770,393 gallons.

At the ordinary general meeting of the Cork Gas Consumers' Company last Thursday, the Directors reported that in the half year ending December last the receipts for residuals were good, but not in proportion to the abnormally high price of coals. The revenue from the sale of gas for private consumption amounted to £19,452; from public lighting, to £2011; and the total receipts were £30,227. The expenditure was £26,116; coals costing £16,132; leaving £4111 to go to the profit and loss account. The amount available for distribution was £3025; and in order to pay the usual dividend, it was necessary to take £2530 from the reserve fund. The cost of coal, less the returns from residuals, was £3369 in excess of the corresponding half of 1899; and under normal conditions no draft upon the reserve would have been needed. In order to meet the increased demand for gas for cooking and heating purposes, the Company have opened at their offices a show-room for cooking-ranges, heating-stoves, and other appliances. The results are already most satisfactory; and the Directors look to their being still better as the great advantages to be obtained from the use of gas as fuel are more generally realized.

The report presented by the Directors at the half-yearly meeting of the Douglas (Isle of Man) Gas Company stated that the profits showed a slight decrease, for which the high price of coal was responsible. Including a balance of £2982 from the previous half year, £7610 was available. A dividend of 35s. per share, the placing of £500 to the reserve fund, and the carrying forward of the balance were recommended. The report and accounts were passed. A resolution to increase the capital one-eighth by a *pro ratâ* issue of new shares among shareholders was also carried.

At the half-yearly meeting of the Dover Gas Company yesterday, the Directors reported that the consumption of gas during the six months ending Dec. 31 increased at the rate of nearly 6 per cent. This figure would have been much higher had it not been for the mild and bright weather prevailing towards the close of the year. The revenue from the sale of 117,103,000 cubic feet of gas amounted to £17,582; residuals produced £5986; and the total receipts were £25,270. The manufacturing expenses came to £17,094 (coal and oil costing £11,971); distribution cost £2668; management, £941; and the total expenses were £21,777—leaving a balance of £3493 to go to the profit and loss account. The amount available for distribution allowed of the payment of the usual dividend at the rate of 7½ per cent. per annum, less income-tax. This came to £2850, and with the balance brought forward left £383 to the good.

The amount available for distribution at the half-yearly meeting, on Monday last week, of the Eastbourne Gas Company was £18,678; and the Directors recommended dividends at the rate of 14½ per cent. per annum on the original capital and "C" shares, and of 11½ per cent. per annum on the "B" shares. After payment of these, there would be a sum of £11,895 to be carried forward. The Chairman (Dr. G. A. Jeffery), in moving the adoption of the report, said the sale of gas in the latter half of last year had gone up from 142,557,000 to 149,734,000 cubic feet, which represented an increase of 5 per cent., and was very satisfactory. The leakage had been reduced from 4·63 to 4 per cent. The total profit was £7747, as compared with £7139 in the corresponding period of 1899. This would not, however, be shown on the balance-sheet, because they had had to pay an excessive price for coal, which had cost £14,000, as against £12,000 before. The price had gone up from 16s. to 20s., and then to 25s., per ton—in fact, the Directors had some difficulty in getting it at any price. The question arose whether they should increase the charge for gas to recoup themselves this extra outlay. When he put that question to the shareholders, they replied most emphatically in the negative, and the Eastbourne Company were among the very few companies throughout England who had not raised their price. Mr. Mitchell said he could not understand the Chairman saying there had been a difficulty in getting coal. Twelve months ago

the Company's stock was 994 tons. At the next half-yearly meeting it had risen to 3356 tons; while at the end of last year it had reached 9450 tons. There did not seem to have been any great difficulty in getting it; but the Directors had followed the mistaken policy of buying a large quantity at a very high price. But for this their earnings would have been considerably more. The Consulting Engineer (Mr. H. E. Jones, M.Inst.C.E.) said it was true that the year before last they had only a small quantity of coal in stock. This was owing to the extreme slackness of the collieries at the time; and the anxiety nearly drove their Manager (Mr. J. Hammond) out of his mind. They must differentiate between gas and railway companies. In the winter the latter had relatively a very small amount of traffic, but with a gas company it was very different; and in his opinion there ought to be in hand at least sufficient for six weeks' consumption in the depth of winter. The report was adopted.

The Chairman of the Elland-cum-Greetland Gas Company (the Rev. G. E. Aspinall) gave an interesting *résumé* of the past year's proceedings at the recent annual meeting, when moving the adoption of the report, noticed in the "JOURNAL" for the 19th ult. Referring to the increased capital expenditure, he said a new exhauster had been put in, and also a new washer-scrubber of a capacity of 1 million cubic feet per 24 hours; while new coal-stores, to hold 800 tons of coal, with tar, liquor, and fresh-water tanks over, having a combined storage capacity of about 1,100,000 gallons, had been erected. The new retort-house in course of erection would add considerably to the generating plant, and would increase the production of the works by 750,000 cubic feet per day. Saving of labour and in cost of production was thus expected to be effected. Coming to the sale of gas, he said this was very satisfactory. The consumption had increased by 6,243,000 cubic feet in the year, and for the first time in the history of the Company the total had exceeded 100 million cubic feet. The increase for the year had been at the rate of 6·6 per cent. The number of ordinary consumers had increased by about 50, and prepayment consumers by 97; the total of the latter being now 790. Increased expenditure had been the rule all round. That which called for special attention was coal, which was £1502 more than in the previous year. The contract price now running was 6s. per ton in excess of the price prevailing two years ago. This meant an increased burden for the year in the coal account of £3165. Having referred to other items of expenditure, the Chairman went on to say that the Company had had an increased income from gas and meter rents to the extent of £1530, of which £674 was due to the increased price of gas and the remainder to additional business. The dividend recommended was declared. After the ordinary meeting, a special meeting was held, at which resolutions were passed sanctioning the Bill now before Parliament. The Chairman and Directors were thanked for their services; as were also the Engineer and Manager (Mr. R. Porter) and the staff.

The half-yearly general meeting of the Enfield Gas Company was held last Thursday—Colonel A. P. F. C. Somerset in the chair. The report presented showed that the sale of gas had been larger by 5·59 per cent. during the six months ending Dec. 31 than in the corresponding period of 1899. The Directors had been obliged to pay a considerably higher price for their coal; but they had been able to meet the increased expenditure without raising the price of gas. The profit resulting from the half-year's working, after providing for interest charges, amounted to £3057. The Directors recommended that dividends at the rate of 5 per cent. per annum on the preference and ordinary stocks should be declared, less income-tax. This would absorb £2698, and leave £359 to be added to the undivided profit, which would then amount to £1778. It would be of interest to the proprietors to know that the Company completed the fiftieth year of their operations during the period under review. The report was adopted, and the dividends were declared.

Presiding at the annual meeting of the Exeter Gas Company on Tuesday last, Mr. Campion said the business was in a very satisfactory condition, and the revenue showed an increase on the previous year of £1057. In one respect the Company had done better than many others, for while they had raised the price of gas by 5d. or 6d. per 1000 cubic feet, the increase in Exeter was only 4d. As the legality of the payment of dividend free of income-tax had been questioned, the dividends would be paid subject to tax. The Chairman concluded by moving the adoption of the report and balance-sheet; and the motion, which was seconded by Mr. H. Drew and supported by Mr. H. A. Willey, was agreed to.

The 109th half-yearly meeting of the Harrogate Gas Company was held last Wednesday. The report and accounts presented showed a balance of £8912 available for distribution. The Chairman (Mr. S. Hornby) presided, and in his address reviewed the operations of the year, which he said were characterized by activity and development in every department; the increase in the gas consumption being very encouraging, notwithstanding the open and mild weather prevailing up to the end of the year. He referred specially to the serious advance in the price of coal and the consequent necessity to advance the price of gas. He, however, looked for brighter prospects, when relief would be felt by gas companies and consumers alike. The report and accounts were adopted, and the usual dividends declared.

According to the report presented at the recent half-yearly meeting of the Kingston-upon-Thames Gas Company, there was a steady and satisfactory increase in the business in the latter half of last year. The revenue from the sale of gas amounted to £29,377; and the amount carried to the profit and loss account was £6625. This allowed of the payment of the usual dividend, which would absorb less than £5000 of the amount available.

The accounts presented at the half-yearly general meeting of the Leominster Gas Company last Thursday, showed a net profit of £1039; and the Directors recommended the payment of the usual maximum dividends. They reported that the increase in the consumption of gas by private persons had been 1,950,500 cubic feet, which was the largest in the history of the Company; being over 10·6 per cent. in excess of that of 1899. It would have been still greater but for the mild weather in December; and it had been largely, though not entirely, due to the introduction of prepayment meters, the demand for which continues.

In the six months ending Dec. 31, the North Middlesex Gas Company had an increase of 4 per cent. in the sale of gas, as compared with the latter half of 1899; while coke and other residuals yielded a larger income. At the meeting of the Company yesterday, it was announced that the amount of profit available for distribution was £4929; and the Directors recommended that dividends for the half year should be declared at the following rates per cent. per annum: On the original capital, £9 10s.; on the ordinary capital, £6 13s.; and on the preference capital, £5. These would absorb £2171; leaving a balance of £2758 to be carried forward. In view of the Company's improved position, the Directors decided to reduce the price of gas by 2d. per 1000 cubic feet, as from the 1st of January. This reduction permitted of the payment of the standard rates of dividend for the current half year.

The half-yearly general meeting of the Portsea Island Gas Company was held at the Offices, Commercial Road, Portsmouth, on the 23rd ult., Alderman Sir John Baker, J.P., in the chair. The Directors reported that the revenue had been £81,044; the expenditure, £66,073—leaving £14,971 to be added to the profit and loss account, and making the available balance £37,424, after £4000 had been added to the extraordinary renewals account. The quantity of gas made in the latter half of last year amounted to 488,352,000 cubic feet, which was greater than in the corresponding period of the previous year by 64,664,000 cubic feet. The Chairman, in moving the adoption of the report, congratulated the shareholders on the remarkable progress which the Company continued to make; and in dwelling upon the satisfactory increase in consumption, pointed out that two prominent features contributing to it were that the ordinary consumers had increased by 430 in the six months, while the number of prepayment meters was 1583 greater. If this increase went on, they would have to go to Parliament for power to further enlarge their works. The report was adopted, and dividends at the rate of 13 per cent. per annum on the "A" and "B" shares, of 12 per cent. per annum on the "C" shares, and of 5 per cent. per annum on the stock of the Company, less income-tax, were declared. This left a balance of £25,232 to be carried forward.

The half-yearly general meeting of the Reading Gas Company was held last Tuesday, when the Directors expressed their pleasure in again reporting continued progress in the business of the Company. The sale of gas to private consumers in the six months ending Dec. 31 produced £25,080; for public lighting and under contracts, £2109; residuals yielded £11,261; and the total receipts were £38,480. The expenditure on manufacture amounted to £27,451; on distribution, to £2196; on management, to £1455; and the total expenses were £33,491—leaving £4989 to go to the profit and loss account, the balance on which was £19,592. The Directors recommended the payment of full dividends for the half year upon all the stocks and shares. The increased consumption of gas led them some time ago to enter into contracts for the construction of an additional holder to contain a million cubic feet of gas; and the work is now in progress. New show-rooms at the King's Road works are nearly complete, and are being fitted with specimens of the best and most modern gas appliances of all kinds. These works are being carried on under the supervision of the Company's Engineer (Mr. Herbert E. S. Baker).

At the recent half-yearly meeting of the Salisbury Gas Company, the Chairman (Mr. G. Fullford), in moving the adoption of the report and accounts for the half year ended the 31st of December, and the payment of the usual dividends, ranging from 5 to 10 per cent. per annum on the various classes of shares, said the Directors were pleased to report a steady increase in the business of the Company, due to the extended use of gas for purposes of illumination as well as for heating and cooking. Mr. W. Young seconded the motion, and it was carried unanimously. Mr. S. Grove proposed that the thanks of the shareholders be accorded to the Chairman, Directors, Secretary, and officers of the Company for their services during the past half year. Mr. C. Fullford seconded the proposition, and it was heartily carried. The Chairman thanked the meeting for their confidence, and alluded at some length to the services of the Manager (Mr. Norton H. Humphrys), and various members of the staff, by whom, he said, the Company were well served, and who were devoted to their work. Mr. Humphrys, replying on behalf of himself and the staff, thanked the meeting and the Chairman for their kind recognition, and expressed the opinion that the business of the Company had never been in a more sound and healthy condition. Alluding to the extension in the use of the incandescent system of gas lighting and the large reduction in the price of mantles last June, he said he was confident that further reductions would follow, and that before long mantles would be sold at 4d. or 5d. apiece.

The annual meeting of the South Shields Gas Company was held last Thursday, when the Chairman (Dr. J. F. Armstrong) moved the adoption of the report, noticed last week. As a matter of course, he began by talking about the price of coals, for which the Company had had to pay £6677 more than they did in 1899. On the other hand, coke and tar together had realized £4854 above the figures for that year; but there had been a falling off in the price of ammonia. Last autumn the Company had a serious application before them by their employees for an increase of 12½ per cent. in wages. This meant an additional expenditure of £3275 to the Company, and they eventually formed a Board of Conciliation with the Tynemouth and Sunderland Gas Companies. After long negotiations, they arranged a compromise, and gave the workers in the retort-house a rise of 4 per cent., and the outside men an increase of 3 per cent. This involved an additional expenditure of £825 per annum; but the Company had come to an agreement with the men that no further application for an increase should be made by them for two years. Another important development was the introduction of prepayment meters. Some 300 of these had been fixed during the year, and the Company were receiving more applications for them than they could deal with. The introduction of these meters would, he thought, mean a considerable increase in their revenue. The proprietors were aware that the Directors were enlarging the retort-house; and they were going to introduce all the modern appliances in its construction. The new inclined retorts would be a great saving. Considering the prices of coal and labour, the year's working had been satisfactory. The report was adopted, and the dividend recommended (making 8 per cent. for the year) was declared. Colonel Dawson moved that Mr. W. J. Warner, the former Engineer of the Company, be granted a pension of £175 per annum, to be renewed at the discretion of the Company, on condition that he gave them every information at any time they required it, relative to the works. Mr. Hedley, in

seconding the motion, said the Company had not erred on the side of liberality. Mr. Warner had served them practically a lifetime, he having been 38 years with them. The motion was agreed to; and the meeting closed with the usual votes of thanks.

The annual meeting of the Tonbridge Gas Company was held on Monday last week. The revenue account showed a profit of £3078; and the profit and loss account a balance of £4693, from which dividends at the rates of 10½, 7½, and 5 per cent. per annum were declared, leaving a balance of £3516 to be carried forward. The Chairman (Mr. John Fagg), in moving the adoption of the report, stated that the past year had been one of exceptional difficulty, owing to the excessive cost of coal; and the Directors had been compelled to raise the price of gas by 4d. per 1000 cubic feet—necessitating, under the sliding-scale, a reduction of 1 per cent. in the rates of dividend. They, however, had arranged to reduce the price of gas at the end of the present quarter by 2d. per 1000 cubic feet, and hoped, when making a new contract for coal, to be in a position to bring it down to its former price. The increase in the consumption of gas—5,581,300 cubic feet, or 10·2 per cent.—had helped considerably to meet the extra cost of coal. The meeting closed with votes of thanks to the Directors, as well as to the Secretary and Manager (Mr. James Donaldson).

At the annual general meeting of the Tynemouth Gas Company next Thursday, the Directors will report that the revenue for the past year amounted to £52,312, and the expenditure to £45,469; leaving a balance of £6843. This added to the undivided profit brought forward (£4044) makes a total of £10,887, which the Directors propose to deal with as follows: The interim dividend at the rate of 5 per cent. per annum came to £3084; payment of a final dividend at the same rate, both less income-tax, £3137; and addition to reserve fund, £500. These sums will absorb £6721, and leave £4166 to be carried to the next account, apart from the reserve fund of £7500 brought forward. The Directors will have the gratification of reporting an increase in the make of gas to the extent of 29,652,500 cubic feet last year, equal to 9·6 per cent., against 6·14 per cent. in the previous year; and an increased sale of 24,144,000 cubic feet, or 8·58 per cent. over 1899. The number of ordinary consumers on the books at the close of last year was 5900; being an increase of 400, or 7¼ per cent., in the twelve months. The automatic prepayment meter consumers at the same period numbered 2176; being 1286, or 144·5 per cent., more than in 1899. There were 1076 cooking-stoves in use—an increase of 285, or 36 per cent. The market for residuals, especially for coke, was satisfactory throughout the year. The increased demand for gas has necessitated the immediate extension of the works. The retort-house walls are well up, and the building will shortly be covered in, and one half furnished with plant of the latest and most approved description. The remainder will be filled as required. This extension will necessarily cause a large outlay of capital; and therefore, at the close of the general business, the Directors will ask for power to raise £30,000 of the additional capital authorized by the Act of 1897. The Company's Engineer (Mr. W. Hardie, Assoc.M.Inst.C.E.) reports that the works and plant are efficient, and are maintained in excellent order.

Addressing the shareholders at the meeting of the Wolverhampton Gas Company last Tuesday, the Chairman (Mr. S. Loveridge) remarked that the accounts were more favourable than could have been anticipated, as the net profit amounted to £8712. The very mild weather up to Christmas was responsible for a lessened demand for gas; but the results were satisfactory, and were due to the economy introduced into the new works, and the increased price obtained for residuals. It was to be regretted that the price of coal had not given way to the extent anticipated; but it was hoped that before the stock was exhausted, there would be a material reduction, when the Directors trusted to be able to lower the price of gas. With reference to the heavy rates and taxes, the Chairman said the Company had had to pay no less than £4772; and it appeared that the income-tax was likely to be increased. The new works had been completed, and it would therefore not be necessary to spend more money for many years upon them. Alderman B. F. Williams suggested that the Directors should consider the desirability of charging less for gas during the daytime for motive power. Mr. C. H. Crane said this matter had occupied the attention of the Directors; but they could not see their way to carry out the proposal. The only plan would be to supply gas-engines at a lower rate. The report was adopted, and the usual dividends declared.

Water Companies.

The Directors' report submitted at the half-yearly meeting of the Barnstaple Water Company yesterday week, showed that there was a disposable balance of £1644; and it was decided to pay a dividend of 10s. on the "A" shares and of 7s. 6d. on the "B" shares. Mr. E. Dennis, who presided, congratulated the shareholders on the satisfactory condition of the undertaking.

The half-yearly meeting of the South Staffordshire Water Company was held in Birmingham last Thursday—Mr. Frank James in the chair. In moving the adoption of the report, already noticed (*ante*, p. 476), the Chairman remarked that the water-rates had increased from £54,228 to £55,437. This was not quite so much as they might have wished. It was not in reference to the domestic supply, which went on increasing, but was due rather to a falling off in the trade supply during the last part of the half year, in consequence of the removal of some works to other localities which were considered more favourable. After providing for interest on the debenture stock, there remained a balance of £22,108, out of which the Directors recommended the payment of a dividend at the rate of 5½ per cent. per annum, free of income-tax. This was a diminished amount compared with that which had been paid for the last three years. So far as the receipts were concerned, they had nothing to complain of; but, on the other side of the account, they had, in common with other companies, to deplore the increase in working charges due to coal. It had been remarked that the only things which had not gone up in price because of the higher cost of coal were railway tickets; but the price of water had not been raised, nor could it be, for they had in relation to domestic consumption a fixed and absolute parliamentary rate. Their engine charges had increased from £7224 to £11,913, nearly the whole of which was due to coal. It accounted for £3773. He did not mean to say that this was altogether the result of the higher prices, because they had pumped more water. In the six months ended Dec. 31 they pumped 1963 million gallons, against 1821 million gallons for the corresponding period of 1899—an increase of 142 million gallons. He did not suppose they would, for the first three months of this half year, experience much benefit from a reduction in the price of coal; and it was impossible to say what would happen in the second half. In Parliament on the previous day a Bill [the Mines (Eight Hours) Bill] was read a second time with reference to coal production, which, it was prophesied, would increase the price 20 per cent. He did not know whether or not this was true; but in that district a Company was being promoted to supply power which, if it had any effect at all, would bring down the price of coal. Therefore, anyone interested in the use of coal should give a helping hand to that Company. He did not think, having regard to the matters over which the Directors had no control, they had presented an unsatisfactory balance-sheet. The amount carried forward would show that they could have paid 6 per cent. and still have carried forward what in olden times would have been considered a good balance. Sir Henry Wiggin, Bart., seconded the motion, and it was adopted; and the dividend recommended was also approved.

AUSTRALIAN GASLIGHT COMPANY.

The 130th Half-Yearly Meeting of this Company was held at the Head Office, in Sydney (N.S.W.), on Monday, the 28th of January—Mr. G. J. COHEN (the Chairman) presiding.

The SECRETARY (Mr. R. J. Lukey) having read the advertisement convening the meeting, the report of the Directors was taken as read. In the course thereof they stated that the net profits amounted, with the balance brought forward, to £57,575; and they recommended a dividend for the past six months of 9s. per share, free of income-tax. This would absorb £51,135, and leave a balance of £6440 to be carried forward. The Engineer (Mr. T. J. Bush) reported that the whole of the plant was in an efficient condition. The number of penny-in-the-slot meters in use at the date of the report was 7500, and the demand for them continued; showing that this mode of obtaining gas was appreciated by the section of the citizens who preferred paying day by day for what they used. The erection of the carburetted water-gas plants at Sydney and Mortlake was near completion; and the Directors expected they would be in full operation by the end of January. Taking advantage of the Commonwealth celebrations, the Directors gave an exhibition of intensified gas lighting in Wynyard Square. The new light was a great success, and fully realized all expectations regarding its illuminating qualities.

The CHAIRMAN, in moving the adoption of the report, expressed the pleasure it gave him to meet the shareholders under circumstances so favourable. The consumption of gas had increased, and the penny-in-the-slot meter consumers were still a source of much satisfaction to the Company. During the half year, the consumption had been about 24 million cubic feet, and for the past twelve months it had reached 40 millions; while since the installation of the prepayment meters, in September, 1897, about 67 million cubic feet of gas had been supplied to this new class of consumers—the sum received therefor being £17,389. As the whole of this amount was paid in coppers, the weight of metal would be about 36½ tons. The plants at Sydney and Mortlake for the manufacture of carburetted water gas would soon be in full operation. There were many advantages attached to this new mode of gas manufacture, not the least of which was that it was anticipated that the gas would in a great measure prevent the formation of naphthalene in the service-pipes. During the Commonwealth celebrations, and since, the Directors had given practical demonstrations of the new intensified system of gas lighting. The installation was most successful, and favourable notices respecting the light had appeared in the Press, bearing out all the excellent qualities claimed by the manufacturers. A sample of the Scott-Snell intensified lamp was on the way out, and would be exhibited in a prominent position in the city immediately on its arrival. The number of public lights in use was 10,389; and the total number of cookers for which gas was being supplied was 10,058. The cookers sold during the half year reached 506. The total number of consumers was over 46,000; and the length of mains in use 1438 miles—57 miles of new mains having been laid during the half year.

Mr. J. POMEROY seconded the motion; and it was carried.

A vote of thanks was accorded to the Directors and officers of the Company; and the proceedings closed.

OTTOMAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 9, Queen Street Place, E.C. Mr. CHARLES GANDON presided; and, in opening the proceedings, he explained that he did so in consequence of the sad loss the Chairman (Colonel J. Le Geyt Daniell) had sustained by the death of his wife.

The SECRETARY (Mr. Thomas Guyatt) then read the notice convening the meeting; and the report and accounts, to which reference was made last week, were taken as read.

The CHAIRMAN, in moving their adoption, referred, in the first place, to the revenue account. He said that to his mind the final result of the working of the half year—that was to say, the profit made—might be considered satisfactory. It was £252 more than in the corresponding six months of the previous year; and this, in face of the increased cost of coal, and the depression of trade in Smyrna, could not be considered unsatisfactory. Beyond this, he had been looking back for the last ten years; and he found the balance of profit on this occasion was greater than it had been at any time during that period with four exceptions—viz., in the December half years of 1893-96, when the profit was somewhat larger. But in those years, they were very favourably situated with regard to coal and freight—in fact, coal then cost less than half what it had done during the past six months. Of course, he did not put these as comparative figures, because they used more coal now; but, nevertheless, he thought that, so far, they might consider the result satisfactory. Again, although coal had cost £1378 more in the past half year, they

had received £1038 more for products—principally from sales of coke. Therefore, if they took the net cost of coal (by the "net cost" he meant after deducting residuals), it actually cost them less last half year than in the corresponding half of the previous year. It was true the difference was only a matter of 2d. per ton; but still it was a decrease. The item of depreciation, renewals, and repairs showed an increase of £790. This, he might explain, was more than due to writing off what was previously carried to the suspense account formed in connection with the expenses incurred in renewing the concession. This suspense account was now entirely wiped out; and therefore it was a debit that would not go forward again. In the gas-rental, they had an advance of £1440, which he thought the shareholders would all consider satisfactory. It was an increase of about 20 per cent. Many English companies had been showing decreases rather than increases, which proved they were flourishing in Smyrna. Their Manager advised them that they were very busy fitting up new houses; and this also gave them hope for the future. He was afraid they could not look forward in the current half year to so successful an issue as they had now before them, because, although they had been suffering from an increase in the cost of coal, it had scarcely affected these accounts. They had been receiving coal under an old contract at what one might call normal prices; and the increased expenditure was due to freights and a greater consumption. In the present half year they would certainly have to face a serious increase in the cost of coal. Whether the sale of their residuals would more or less compensate for this remained to be seen. He was afraid it would not, because they had coal during the past half year at the normal price, and had benefited by the advanced price obtainable for coke, which they were hardly likely to get this half year. He was therefore afraid they must not look forward to maintaining the favourable results shown by the present accounts. At the same time, he thought they would be able to hold their way, more especially as they would not have to meet the amount for the suspense account, and might hope to get more than usual for their products. The increase in the rental was almost abnormal; and he hardly expected it would be maintained. But their Manager gave them hope that it would be; and the returns so far seemed to corroborate his opinion. Going to the capital account, it would be found there was an addition to what was called "investments," but which meant plant, of £3378. This was almost exclusively due to extensions of mains and lamp-columns to provide for the new lighting contract, which, of course, would bring in additional revenue. It was true they were getting low for capital now. At the last meeting, the Chairman stated that they were in treaty for an extension of the concession from 40 to 70 years, and that, if this were obtained, they would have to call up the balance of the debenture capital authorized—viz., £5000; £20,000 having been already raised. The question of the extension of the concession, however, had not been settled yet. But in the meantime, the balance of capital in hand had dwindled so much that the Directors had been obliged to borrow money; and he thought they would have to ask the shareholders to subscribe the additional £5000 of debentures. Beyond this, he thought that, in the near future, they would require further capital if the consumption of gas went on at anything like the rate it was proceeding at present, in order to make extensions to the works. At all events, their Manager advised them so; and from his (the Chairman's) experience he was in accord with him. If this proved correct, they would have to obtain more capital not only for extensions of works, but for enlargements of mains. They were handicapped now (as Mr. Andrews would confirm) in supplying gas to some of the outlying districts, more especially the most remote one, which was increasing. He felt sure, if they could give the inhabitants there more gas, they would consume it.

Mr. H. W. Andrews seconded the motion.

Mr. A. M. Paddon, in a few remarks, voiced the sympathy of the shareholders with Colonel Daniell in his loss. As to the accounts, he said that, with the universal depression of the gas industry at the present time, it was quite a pleasure to come to a meeting like this, and find such an improved state of things. He thought the Chairman had not dwelt adequately on the great credit that this result reflected upon the administration of the Company's affairs in Smyrna.

The Chairman, replying to Mr. W. Hughes, said the Directors had not lost sight of the question of local coal; but their Manager had advised them there was nothing to be gained by using it. He (the Chairman) hoped to be in Smyrna during March or April; and he intended making personal inquiries about this coal. They hoped to get English coal cheaper very soon.

The motion was unanimously carried.

On the proposition of the Chairman, seconded by Mr. Strachan C. Clarke, a dividend at the rate of 7 per cent. per annum was declared on both classes of capital.

The retiring Directors (Colonel Daniell and Mr. H. W. Andrews) and Auditor (Mr. T. H. Cooke) were re-elected. Mr. C. K. Butt having retired from the auditorship through ill-health, Mr. A. W. Cooper was elected to succeed him, on the motion of Mr. Paddon, seconded by Mr. F. W. Church.

Proposed by Mr. S. Simmelkjör, and seconded by Mr. Hughes, a hearty vote of thanks was accorded to the Chairman and Directors, to the Engineer and Manager (Mr. John Gandon), and to the Secretary.

The Chairman, in responding, compared the early position of the Company with its present prosperity—mentioning that he had been connected with the undertaking from its initiation, and could remember the time when there was no dividend paid.

Mr. Guyatt replied for the officers; and the proceedings ended.

HORNSEY GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, No. 63, Chancery Lane, last Friday—Mr. John Drew in the chair.

The Directors' report showed that there had been an increase of 7¼ per cent. in the quantity of gas sold in the past half year, as compared with the corresponding period of 1899, and that the profit was sufficient to pay dividends at the rate of 12¼ per cent. on the "A" stock and 9¼ per cent. on the consolidated stock, with £13,196 to be carried forward.

The Chairman, in moving the adoption of the report, said three factors in gas undertakings helped to make good balance-sheets—viz., cheap coal, foggy days, and high price to consumers. Now, they had had dear coal, mild and open weather, with very few foggy days, and a low price to consumers; and yet the shareholders must have every reason to be satisfied with the accounts, which enabled them to receive full dividends, and have a substantial balance to carry forward. As to coal, they had an old contract not fulfilled when the increase was made in the price; and they reaped the advantage of less expenditure. Oil, too, had been purchased at less than ruling prices; and in selling residuals, the price of coke had been in their favour. The dearness of coal had also increased the demand for gas-stoves; and, having sent out 500 of these, a large income had been secured. The price charged for their gas—3s. per 1000 cubic feet—was the lowest in the history of the Company, and compared favourably with the prices of the two neighbouring Companies, which were 3s. 4d. and 3s. 5d. respectively. He was inclined to think coals would be lower; and as soon as the Company could do so they would lower the price from its present figure. At the meeting next August, the Directors would give their views as to an application for further capital powers, as it was impossible to keep pace with the demand for new mains and services without doing so.

The motion was carried unanimously, as were also resolutions declaring the dividends recommended, re-electing the retiring Directors (Mr. John Drew and Mr. E. T. E. Besley, K.C.) and one of the Auditors (Mr. Wright), confirming the appointment of Mr. William E. Roberts, the new Secretary, and according a vote of thanks to the staff.

The proceedings closed with the usual vote of thanks to the Board.

ASCOT DISTRICT GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Monday of last week, at the Offices, No. 46, Cannon Street, E.C.—Mr. Robert Berridge, Assoc.M.Inst.C.E., in the chair.

The Chairman said that, as the Company were so intimately bound up with the Royal Borough, he was sure the shareholders would not think it out of place if, before commencing the business of the meeting, he alluded to the death of the Queen. It was a loss which had been felt very keenly, not only in this country, but also in the Colonies, in America, and in Europe—in fact, throughout the civilized world. They all sympathized very deeply with the Royal Family, and thanked the Emperor of Germany for the great thoughtfulness he had shown on the sad occasion.

The Secretary (Mr. W. A. Schultz, F.C.A.) read the notice convening the meeting; and the report and accounts were taken as read.

The Chairman, in moving their adoption, said the Company had arrived at a point when the Directors could heartily congratulate the shareholders upon having entered upon a period of prosperity. They were now able to pay a 5 per cent. dividend; the works were in a splendid condition; and they looked forward to increasing the dividend in the future. When the days of mourning were over, the probability was that the King would give a fillip to the social life of the neighbourhood; and with renewed social life would come increased prosperity. During the past half year, coal showed a considerable increase in price—namely, 7s. 6d. per ton over the figure ruling two years ago, and 5s. 3d. per ton more than last year; but, in spite of this, the Company had not raised the price of gas. The Bagshot works were kept in operation until the new main was laid; but now all the gas was produced at Sunninghill. The Bagshot works were very dilapidated; and they could not manage to make there more than between 7000 and 8000 cubic feet per ton, whereas now they were making 10,800 cubic feet per ton. The railway siding had been completed and opened for traffic; and this would cause a saving to the Company of about £100 a year in carting, pumping of tar and liquor, &c. A new house had been built on the works, having an office, store-room, show-room, photometer-room, and engineer's room; and there had also been erected a cottage for the foreman A new 8-inch main had been laid from the works at Ascot to the Bagshot works; and they had also laid a 12-inch main from the end of the old 12-inch main to the two 6-inch mains to Bracknell. This was necessary, as once or twice Bracknell had very nearly been put into a state of darkness. The whole of the 8-inch main which they had replaced by the 12-inch one had been used again on the road to Bagshot. Bracknell was now well lighted. With regard to the accounts, the profit made during the half year to Dec. 31, 1899, was £1290; while in the past six months it had amounted to £1411, which was a very considerable increase. The carry forward on the present occasion was £967, as compared with £867. The gas made during the past six months amounted to 15,262,900 cubic feet, as against 12,630,000 feet. The make per ton was 10,800 cubic feet, against 10,352 feet; and it would have been considerably more than this, if they had not had to keep the Bagshot works in operation. The gas sold during the half year was 13,271,400 cubic feet, as against 11,488,100 feet. The percentage of unaccounted-for gas was a little higher; but this was in consequence of the large amount of main-laying done, which had caused a certain waste of gas. The amount received for coke was 23s. 8d. per ton, as compared with 15s. 9d.; the receipts per ton of coal carbonized being 9s. 8d., as against 7s. 6d. The ordinary consumers, including Bagshot, now numbered 476, prepayment consumers 164, stoves on hire 236, and public lamps 127. In the first year of actual work of the Company (1883) the gross revenue was £902; and no dividend was paid (except in 1884) until 1889, when the revenue for the year was £280, and a dividend of 2 per cent. was declared. The revenue after this increased by about £310 a year until 1891; and then for seven years, until 1898, the increase averaged £193 per annum. The dividend had meanwhile grown to 3½ per cent. In 1898, the revenue was £5090; in 1899, £6080; and in 1900, £7096. This was an increase of just £1000 a year; and hence the 5 per cent. dividend now recommended. This result was to a great extent owing to the management of Mr. Brooks. In view of the opinions expressed at the last meeting, the Board felt

that the time had now come when they might reasonably increase the number of the Directors; and they had therefore appointed Mr. Henry Woodall—a gentleman of great experience in all matters connected with gas. He could not close his remarks without stating that the Engineer always carried out his work in a most exemplary manner. The carbonizing returns were his best testimonial; and these, in the face of the uphill fight he had had for the past six months, did him infinite credit. The Directors were quite satisfied that Mr. Brooks had the interests of the Company closely at heart. As to the future, he thought the works would be complete when a new gasholder had been erected. They would have to face this question by and by, as they had at present only one holder. To carry out this work, it would be necessary to have more capital; and the Board were thinking of offering the remaining £8190 when a favourable opportunity occurred.

Mr. F. BRIDGES seconded the motion.

Mr. SMITH asked if the Directors thought they could maintain the 5 per cent. dividend, because he did not think the expenditure of the Company should be increased until the shareholders could depend upon receiving this return. He thought a 5 per cent. dividend would place the Directors in a position to ask the shareholders for more capital, and that there would be no difficulty in raising what money they wanted.

Mr. SAMUEL SPENCER inquired if the Bagshot works were to be pulled down. He very heartily congratulated the Directors on the present condition of affairs, which was the best he had known. He had no doubt the dividend could be maintained.

The CHAIRMAN said they had a holder at Bagshot which they utilized; but the fittings at the works were utterly worthless. There was nothing there of any value whatever; everything would be sold as old iron, with the exception perhaps of a few pipes and the purifier. The cost of the purchase of the Bagshot works was included in the previous half-year's accounts. The figures in the present accounts comprised the two mains—one to Bagshot and the other to Bracknell.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. SPENCER (who suggested that the present would be a good opportunity for starting a reserve fund, instead of carrying forward so much undivided profit), a dividend at the rate of 5 per cent. per annum for the half year, less income-tax, was declared.

The retiring Director (Mr. Robert Berridge) having been re-elected,

Dr. STRONG moved that, in consequence of the large increase of the Company's business, coupled with the purchase of the Bagshot works, it was desirable that the number of Directors be increased to four. He was glad that the Directors had seen fit to fall in with his views by inviting Mr. Henry Woodall to take a seat at the Board.

Mr. SPENCER seconded the resolution, which was carried; and the appointment of Mr. Woodall as a Director, as from Jan. 1 last, was afterwards confirmed.

It was next agreed that the salary of the Secretary be increased to £200 per annum, together with a sum of £50 for office expenses, and that the Directors' fees be raised to 250 guineas a year.

The Auditors (Messrs. T. A. Welton, F.C.A., and F. Bridges) having been re-elected,

Dr. STRONG proposed a hearty vote of thanks to the Chairman, Directors, officers, and employees for their services to the Company. They knew that there had been a very large increase of work in all departments. More gas had been made from the same quantity of coal; and this showed great attention on the part of the Manager and everybody concerned.

Mr. BRIDGES having seconded the proposition, it was unanimously carried, and briefly acknowledged.

WATER-GAS PLANT AT THE OLDBURY GAS-WORKS.

Last Friday, on the invitation of Mr. J. W. Wilson, M.P., the Chairman of the Gas Committee, the members of the Oldbury Urban District Council paid a visit to the gas-works, to inspect the installation of carburetted water-gas plant which has recently been completed by the Economical Gas Apparatus Construction Company, Limited, under the superintendence of the Gas Manager (Mr. A. Cooke). In consequence of the rapid and continuous demand for gas, the Committee some months ago had to face the question of how it could best be met. Owing to the inflated prices ruling for all kinds of constructional ironwork, they felt that it was out of the question to recommend the Council to spend from £15,000 to £20,000 in laying down additional plant of the usual kind; but they favourably considered the advisability of adopting the manufacture of carburetted water gas. A deputation visited the Lea Bridge and Rochester Gas-Works; and, as the result, they unanimously recommended the Council to have an installation of water-gas plant. That which had been put in was at present capable of producing 300,000 cubic feet of gas per diem. The contract price fixed was £5663, to which must be added the cost of altering one of the retort-houses to receive it. This had been done by the Committee's own staff, at an outlay of about £1300. The engines, exhausters, blowers, boilers, and pumps are in duplicate, and are capable of running plant equal to 600,000 cubic feet per diem; and the purifiers, station-meter, oil-tank, and boilers are designed for dealing with this quantity. The process was fully explained by Messrs. Wilson and Cooke; and the members appeared to be perfectly satisfied with the money expended on the plant. After the inspection, Mr. Wilson entertained the party to luncheon at the Talbot Hotel.

Cromer Water Supply.—The Directors of the Cromer Water Company have written to the Urban District Council to the effect that while they have no desire to part with their undertaking, they would not resist the insertion in the Bill which they were promoting of a clause giving the Council power to purchase compulsorily, subject to certain conditions. The offer was accepted, subject to the clause being approved by the Council's advisers; and the Clerk was directed to instruct the Parliamentary Agents to advise the Council as to the necessary clauses and steps to be taken in the matter.

UNDERGROUND COMMUNICATION BETWEEN RAMSGATE HARBOUR AND THE GAS-WORKS.

Interesting Proposals and Estimate of Cost.

Mr. W. A. M'Intosh Valon has just been evolving a scheme for connecting Ramsgate Harbour and the gas-works by means of a tunnel, primarily for the conveyance of coal to the works, and secondarily for the transmission of other material required either at the works or elsewhere. The cost will run into a good round sum; but the economical and other advantages will, it is conclusively shown, far outweigh the expense. The entire matter has been the subject of a report by Mr. Valon to his Committee; and it is interesting reading, inasmuch as while tunnelling from one part of a gas-works to another is by no means an unknown thing, tunnelling to this extent for the economical transport of gas-works material by electric traction is a novel project, and therefore requires to be recorded.

Of the preliminary matters which called for Mr. Valon's attention, little need be said; but early in his study of the question, he saw the necessity of finding out if it was possible to get the powers required to make the tunnel by Provisional Order. A consultation which the Town Clerk and Mr. Valon had with the Local Government Board resulted in the opinion that the powers to construct the tunnel could not be obtained by a Provisional Order; but it was thought possible it might be done under the Light Railways Act. Otherwise powers would have to be sought by Act of Parliament. An interview with the Light Railways Commissioners, and the submission of an explanation of the proposal in writing, brought from them a letter which contained the following: "It does not appear that your suggested proposals as explained in your letter are such as to preclude the consideration by the Commissioners of an application embodying the same if made to them under the Light Railways Act."

The letter to the Commissioners so lucidly describes the scheme and its advantages that we cannot do better than to give it practically as it stands. "The light railway," it says, "would be about ¾ mile in length, entirely in tunnel excavated in the chalk at an average depth below the surface of about 40 feet, and for the greater part of its length under public streets, and would be in connection with tramways to run along the various quays of the Harbour. The line would be single (3 ft. 6 in. gauge) with one or two passing places; the gradient averaging 1 in 100, the traction by electricity, the weight of each truck with its motor and load not exceeding 3 tons. No shafts would be required for ventilation, the opening at each end being sufficient for that purpose. Under these conditions, there would be little or no vibration perceptible in the houses above, which would suffer no depreciation in value whatever in consequence of the construction or working of the railway. The estimated cost of the work, including all plant, is £20,000. The railway would be used for conveying coal to the gas-works, the present cost of its haulage and handling amounting to £1200 per annum. Besides coal, all the materials required by the Corporation in repairing streets and highways and for their other works, and which principally arrive by sea, would pass along the railway, as the Corporation depôt adjoins the gas-works. The only access to the town and neighbourhood from the Harbour is by four roads—two of a very steep nature—leading to the lofty cliffs on each side of the town and along which it is not desirable that goods traffic should pass; the houses there being of a residential character and chiefly occupied by visitors seeking rest and quietude. The other two roads—one also very steep—which lead through the centre of the town are so narrow in parts as not to allow two vehicles to pass one another, and in consequence of the restricted width of the bordering footways passengers in passing one another have frequently to step into the carriage-way. The traffic along these two roads consists principally of the carriage of goods, materials, and merchandise to and from the Harbour, such as timber, stone, bricks, and other building materials, rigging and ships' supplies of all kinds, ironwork, coals, imported produce, &c. Ramsgate imports largely for this part of the county, and the trade of the town and harbour is rapidly increasing, and with it the inconvenience and danger to the public from the congested state of these two streets. This would be greatly relieved by the proposed railway, as the Corporation desire that its use should not be confined to the conveyance of goods belonging to them, but that the public should have the use of it for the carriage of goods of all kinds to be conveyed in the Corporation trucks to the neighbourhood of the gas-works, which would be a most useful centre for the distribution and collection of goods. To encourage the public to use the railway, they would be charged by the Corporation the lightest rates possible, consistent with the capital expended on the work and the cost of carrying on the undertaking. It is anticipated that with the streets of the town (they are all very narrow) relieved of the principal part of the Harbour traffic, the present and prospective inconvenience and danger to the public arising therefrom would be in a very great measure remedied."

That is the case for the tunnel and light railway; but it does not exhaust Mr. Valon's proposals in connection with it. He states that the coal storage at the works is very limited; and he therefore suggests that a coal-store should be erected at the Harbour—the coal being unloaded by means of the crane from the ship into the store, the bottom of the coal-store being formed of bunkers by means of which the railway trucks could be filled by merely turning a handle. By this means, the difficulty of increasing the coal storage at the works, owing to the restricted site, would be overcome, and at the same time the working of the trucks would be equalized in such a way as to enable the labour to be economically worked; while the coal, when arriving at the works, could be pitched direct into the elevators ready for use—in this way reducing the cost of trimming it.

On the grounds of both convenience and economy, Mr. Valon has no hesitation in recommending the adoption of electric traction. This system has been used for some time for the operation of tram lines in coal mines; and it has been found to give a very large saving indeed over the ordinary methods of either horse or rope traction.

In connection with this scheme of bringing coals through a subway to the gas-works, Mr. Valon suggests the further question as to the

desirability of the Committee being carriers of their coals from the North. If, he remarks, the Committee decide to do this, it should be done by means of a steamer built specially for the purpose. In consultation with the Harbour Master, he suggested that a steamer carrying from 500 to 600 tons, with a draft of not more than 10 ft. or 10 ft. 6 in., would be the kind of vessel most suited to the Harbour. If, however, the Committee should decide that they will not be their own carriers, it will then be desirable, in view of the economical working of the tunnel scheme, to enter into a lengthened agreement with some firm of repute, who may have a steamer of the right character, or who would build one suited for the port, to deliver the quantity of coals required annually by the Corporation. Of course, no firm would set aside or build a steamer for this work unless they were guaranteed the carriage of the Corporation coal for several years. Mr. Valon thinks, however, the profit which would have to be paid to the carriers would be better if saved to the Corporation by the running of their own steamer.

The following is Mr. Valon's

Estimate of Cost of the Tunnel, Traction, Staging, and Electric Hoist.

Excavation in chalk, brickwork entrance and exit and supports where necessary	£9,500
Rails, electric conduits, trucks, motors, &c.	5,500
Staging and electric crane	1,500
	£16,500
10 per cent. contingencies	1,650
	£18,150

Working Expenses.

Traction and unloading	£170
5 per cent. on £18,000	900
5 per cent. repair and maintenance on £7000 (electric rails and staging)	350
(Say £1500.)	£1420

Estimated Cost of Working Steamship Carrying 600 Tons.

Sinking fund and interest on outlay for steamship costing £13,000 (ship £12,500, stores £500) at 20 years' purchase		£874
Working expenses per six months	£2000 × 2 = £4000	
Insurance	£400 × 2 = 800	
		4800
Wear and tear, 5 per cent. on £12,500		625
		£6299

Return on Expenditure.

48 journeys between Newcastle and Ramsgate per annum equals 28,800 tons. £6299 ÷ 28,800 tons = 4/4 per ton. Sailing ship, present rate, 7/6 per ton; average, 5/- per ton. 28,800 tons at 5/- = £7200. Difference in favour of steamer, £901.

THE RICHMOND-GLOVER AMALGAMATION.

Price of Gas-Works Supplies.

It is a rare occurrence that the "JOURNAL" devotes space to the recording of the proceedings at the meetings of companies or firms having commercial relations with the gas-supply industry in any individual branch; and an exception is made on this occasion in order that intelligence on two matters of passing interest may be presented to our readers. The report of Messrs. Richmond and Co., Limited, was noticed in last week's issue; and it referred, among other matters, to the amalgamation of the Company with the firm of Messrs. George Glover and Co., Limited, whose association with the gas industry has extended over the greater part of half a century. It is in view of this fusion of two important trading interests that the annual meeting of the first-named Company, held on Thursday last, mainly calls for notice. The Chairman (Mr. E. W. T. Richmond) presided; and his address to the shareholders was, leaving out minor matters, divided into three sections. In the first place, he gave statistics showing the progress which the business he founded has made; then he passed on to deal with the question of the prices to gas suppliers of the articles manufactured by the Company; and, finally, to the amalgamation question.

With the first section, we are not concerned. On the second, Mr. Richmond remarked that, although he quite believed there was a good deal to be said on the question of the prices of articles in the manufacture of which the Company were interested, he could not help reminding those gentlemen who were concerned in reducing the cost of the goods they purchased, that the Company were paying advanced prices for materials for some twelve months before they asked the gas authorities to pay them. They were paying the increased rates for materials all through 1898; and it was not until July, 1899, that the prices were raised throughout the trade by 7½ per cent. Now, during the last few weeks there had been a drop in the cost of iron; and they were asked to take off the increase on their goods (which they deferred putting on for twelve months) immediately the reduction in the price of iron came about. It was a good thing to sell their commodities at as low a price as possible, consistent with a proper return on the capital employed, and the adequate remuneration of the employees and those engaged in the management of the business. Having secured this, he quite agreed that prices should be put at the lowest level. But he did not know that the prices of materials would remain at the figures they had suddenly dropped to. And, surely, they were not expected to reduce their prices until contracts for materials had run out. As in every other manufacture, they had to contract in advance; and they had contracts running for materials at the higher prices. Therefore it was only fair that, for a short period at any rate, the advances they had put on should remain. But directly it could be done, it would be a wise and proper thing to modify them, and then eventually, as soon as prices reached a normal level all round, to remove them altogether. Having given twelve months to their customers, they fairly expected a little breathing space in return.

Coming to the third section of his address, Mr. Richmond said the matter was the most important in the Directors' report. It referred to the acquisition of Messrs. George Glover and Co.'s business. Briefly, he explained that Messrs. George Glover and Co. had formed themselves into a Limited Company; and this Limited Company handed over the shares to Richmond and Co., and thus the amalgamation took place. This method and procedure enabled the meter firm to trade as George Glover and Co. still, independent of Richmond and Co. The Directors had been advised that it was desirable for the purposes of quotation that their own Company should state in their title what their trades were; and therefore they were altering the name to the Richmond Gas Stove and Meter Company. At this point, the report was adopted, the dividend declared, and formal business transacted.

More detailed particulars concerning the amalgamation were given at a subsequent extraordinary meeting. Four separate resolutions were proposed. The desirability of acquiring the business of Messrs. George Glover and Co., and authorizing the Directors to enter into the necessary agreement, were the subjects of the first. By the second, the style of the present Company was proposed to be altered to that previously stated. The third recommended the increase of the capital to £200,000 by the creation of 60,000 new shares, of which 50,000 should be additional ordinary shares of £1 each, and 10,000 additional preference shares of £5 each. The fourth merely referred to changes in the Articles of Association. The resolutions were proposed separately by the Chairman; but, in the course of his explanations, he mentioned that the Limited Company formed by Messrs. George Glover and Co. had a capital of £60,000. Richmond and Co. were allotting to the two partners in the business the sum of £34,000 in cash or preference shares in agreed proportions, and £11,000 worth of ordinary shares. The price they were paying they considered a fair one; but, at the same time, it left them, on Messrs. George Glover and Co.'s average profits, a very fair margin of profit indeed. They had secured, he was convinced, one of the soundest and best meter businesses in the country. The concern was lying practically dormant. The firm had accepted with thanks whatever business was tendered to them; and they had not endeavoured to go farther afield. But already arrangements had been made for the purchase of the lease of property adjoining, which would enable them to double the size of the works, and give space for further increasing the business as it became desirable. Throughout the negotiations, they had had the most pleasant relationship with the Messrs. Glover. Very unfortunately the health of Mr. Thomson Glover was so precarious that he was retiring from the active management of the business, but he would hold the position of Consulting Engineer. Mr. George Glover would remain as Managing Director; and he had accepted the office of Vice-Chairman on the Board of the Richmond Company. He (the Chairman) thought they had secured a most useful and desirable gentleman to fill that post. It might also be of interest to mention that Mr. George Glover desired to take his portion of the purchase price entirely in shares. All the Directors, the Chairman added, looked forward with great satisfaction and considerable confidence to this amalgamation. Among other matters, he stated that Messrs. George Glover and Co. had practically no machinery; they having continued to make their meters by hand. But it was now intended to introduce up-to-date machinery. All the resolutions were carried.

ELECTRIC LIGHTING NOTES.

An inquiry was held at Oldham last Tuesday by Mr. R. H. Bicknill, respecting an application by the Oldham Corporation to the Local Government Board for leave to borrow £157,000 for purposes of electric lighting and traction.

A Local Government Board inquiry was held at Newcastle last Tuesday respecting an application for sanction to borrow £10,000 for electric lighting purposes. The loan is needed for lighting the principal thoroughfares of the city in which tramways are being laid.

The Lighting Committee of the Leeds Corporation decided last Wednesday to purchase plant for the extension of the electricity works at a cost of £24,135. This forms part of the expenditure which the application to the Local Government Board for powers to borrow £510,000 is intended to cover.

The electric light supplied by the Tynemouth Corporation to North Shields was tested on several occasions during the past week, and proved in every way satisfactory. A number of large arc lamps in the principal thoroughfares have been illuminated, and found to give an excellent light. A number of places of business have been lighted.

At a meeting of the Electricity Committee of the Manchester Corporation last Wednesday, it was resolved that no new applications for current, either for light or power, can be granted at present. All these must, it is stated, stand over until the Committee are able to ascertain whether or not the Bloom Street generating station can be finished in time to take up its load for the winter. If that fact is assured, the applications can be acceded to. If not, the Committee will have to stay their hand.

The City Electrical Engineer of Worcester (Mr. C. J. Sutherland) has just issued his report on the working of the electricity supply in the city during the past twelve months. The actual profit is £3669; but the charges for repayment of capital and interest absorb the whole of this sum except £3. The smallness of the profit is put down to the higher price of coal; the bill having increased by £1051, though the consumption was less by 100 tons. The total amount expended on the works has now reached £82,629.

The Tramway and Electric Lighting Committee of the Dudley Town Council recently waited upon the Local Government Board to urge a reconsideration of their decision not to sanction any loan for the purpose of free wiring the premises of intending consumers of electricity for lighting purposes; but, being unable to obtain any alteration in the decision, which the deputation were informed must be taken as final, they recommend that the scheme be abandoned. They also recommend that consumers should have the option of being supplied at the rate of 5d. per unit throughout, or at the rate of 6d. per unit for two hours a day, to be determined by the Corporation or their Engineer from time to time, and 1½d. per unit for the remaining 22 hours, and

that no rental be charged for meters. Their report containing these recommendations will come before the Council to-day.

The enlarged scheme of electric light works extension, involving an outlay of £23,200, has been passed by the Coventry City Council. The circumstances under which a smaller scheme was referred back to the Committee have been reported. The smaller scheme would have increased the output 60 per cent.; but the present one would double the working capacity, and would carry the concern over the winters of 1901 and 1902. At the Council meeting last Tuesday, Alderman Hill gave particulars of the great development of the scheme since its inception in 1895, and pointed out that, had there not been the increase in the price of coal, the receipts would have met the expenses. He believed that in two years the undertaking would be on a paying basis, and at that period he estimated the revenue would be £10,000 per annum.

The "Electrical World" of New York has published the following statistics showing the progress made with electric lighting in Canada during the past ten years: "In 1891 the census returns gave 80 establishments selling electric light in the Dominion; in 1897 there were 187, which number increased to 297 in 1900. The electric lamps supplied by the establishments selling light numbered 443,897 in 1897 and 807,772 in 1900. The largest establishment in Canada in 1900 was the Royal Electric Light Company, of Montreal, supplying 78,762 incandescent lamps and 1805 arc lights. The next largest is the Toronto Electric Light Company, supplying 75,000 incandescent and 1650 arc lamps, while the Ottawa Electric Company stands well to the front with 77,255 incandescent and 621 arc lamps. The province of Ontario has made rapid strides in the employment of electricity for lighting purposes; using 418,573 lamps in 1900, against 201,955 lamps in 1897. The province of Quebec increased the number from 185,892 in 1897 to 235,322 in 1900. The other provinces have all developed the use of electricity for lighting purposes. British Columbia had a couple of establishments selling electric light in 1897, and these operating only a very small number of lamps. In 1900, however, this province had 13 electric companies, with an equipment of 52,653 lamps. The use of the arc light in Canada has increased from 9516 lamps in 1897 to 11,917 lamps in 1900."

Lighting matters are receiving a good deal of attention at Devonport just now. In addition to the controversy with the Gas Company, the Corporation have on hand a big electricity undertaking in which the lighting of the main streets will be a prominent feature. The foundation stone of the electricity works has lately been laid by the Mayor (Mr. H. J. H. Graves), who congratulated the town on the fact that they were embarking in municipal trading and enterprise of that kind. The works are designed for the supply of electricity both for lighting and tramway traction. They are situated on the east bank of Stonehouse Creek, in the district of the Stonehouse Urban Council; and, as already explained in the "JOURNAL," the Corporation, by arrangement with that body, take over the powers to supply electricity in Stonehouse as well as in Devonport. Alderman J. B. James, the Chairman of the Electricity Committee, announced, on the occasion of the ceremony, that it was anticipated the expenditure would be some £7000 less than the original estimate of £69,000. The land, which he described as sufficient for present and prospective purposes, cost £15,000. It is an acre in extent, and has waterside communication, so that the coal brought by sea may be discharged right into the works. An old flour-mill which formerly occupied part of the site is being converted into offices, storage battery rooms, and stores; but the power station will be almost entirely new, and a new chimney-stack is being built.

Mr. Peterson, of London, has made application for an Order for the electric lighting of Carnarvon; and a Board of Trade inquiry has been held, at which the Town Council appeared in opposition. It seems from the proceedings that the Council had conceded just a bit too much to Mr. Peterson, and he had taken the fullest advantage of it. The first overtures of this gentleman to the Corporation had reference to the construction of an electric railway to Dinas Dinlle; and on this question the negotiations seem to have run off smoothly. Later in some way the question of the lighting of Carnarvon was dragged in; but quite as a subsidiary matter, so the Corporation contend—Mr. Peterson having stated that he could not carry out the one without the other. Now, however, it seems that he has reversed the position (again assuming the Corporation version is the correct one), and made the electric lighting of the town the main part of his application—the light railway taking a back place. The idea of Mr. Peterson is to transfer the Order, if obtained, to a Company within six months. In the case which he laid before the Board of Trade Inspector, he alleged that the Council's ownership of the gas-works was the ground of their opposition now. Assertions were made that the gas was bad, and that the Corporation had sufficient work in hand without entering into electric lighting. The Council sought to show they had had no intention of handing over the monopoly of the public lighting of the town to any individual or private concern, charged Mr. Peterson with having broken his pledges, and stated that they intended themselves to apply for an Order. There the matter rests pending the decision of the Board of Trade.

One of the Coventry papers lately contained some sharp criticism of the management of the electric lighting undertaking of the Corporation by a correspondent who is both a gas and an electrical engineer. In the course of his letter he says: "It is astonishing to find the Electric Light Committee, after trading for many years at a loss—that is to say, the whole body of ratepayers have had to contribute towards the cost of supplying electricity to a comparatively few citizens, who, in all probability, are quite able to bear the cost themselves—should continue to increase the capital expenditure. There is no doubt that there did not exist in Coventry sufficient demand for electrical supply at the time the works were established to warrant the Corporation in embarking upon the venture; and the matter has been made worse by selling current at under cost price, and by laying mains unremunerative and speculative in the extreme. It will, I think, be generally agreed that it is not the duty of a Corporation to speculate with ratepayers' money, or to have to create a demand for any public supply. It has been stated that only seven consumers were connected when the supply was started, and also

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 603.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 12	10½	Alliance & Dublin 10 p.c.	19½—20½	+½	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13½—14½	..	5 3 5
300,000	100	Jan. 2	5	Australian 5 p.c. Deb. .	99—101	..	4 19 0
200,000	5	Nov. 14	6	Bombay, Ltd. . .	6—6½	..	4 12 4
40,000	5	,,	6	Do. New, £4 paid	4¼—4¾	+¼	5 6 8
380,000	Stk.	Feb. 14	12	Brentford Consolidated	258—263	..	4 11 3
270,000	,,	,,	9	Do. New . . .	185—190	..	4 14 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	128—132	..	3 15 9
159,375	,,	Dec. 13	4	Do. 4 p.c. Deb. .	113—116	..	3 9 0
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig.	225—230	..	4 6 11
226,320	,,	,,	7	Do. A. Ord. Stk. .	160—165	..	4 4 10
1,022,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max. .	121—123*	+2½	4 1 4
420,000	20	Sept. 28	10	British.	39—41	..	4 17 7
50,000	10	Feb. 28	12	Bromley, Ord. 10 p.c. .	24—26*	+1	4 12 4
79,000	10	,,	9	Do. 7 p.c. . . .	19—21*	+1	4 5 8
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8¼—8¾	..	6 17 2
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—100	..	4 0 0
150,000	20	July 12	8½	Cagliari, Ltd. . . .	23—25	..	6 12 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	14—15	..	5 6 8
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Oct. 12	12¾	Commercial Old Stock	277—282	..	4 10 5
236,425	,,	,,	9¾	Do. New do. .	208—213	..	4 11 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	132—137	..	3 5 8
800,000	Stk.	Dec. 13	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Feb. 28	5	Crystal Palace Ord. 5 p.c.	115—120*	+½	4 2 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	127—132*	−½	3 14 1
486,030	10	Jan. 31	11	European, Ltd. . .	18½—19½	..	5 12 10
354,060	10	,,	11	Do. £7 10s. paid	13½—14½	..	5 13 9
15,079,885	Stk.	Feb. 14	4 1/16	Gas- 4 p.c. Ord. . .	96—98*	..	4 9 9
2,600,000	,,	,,	3½	light 3½ p.c. max. .	90—92	+1	3 16 11
3,799,735	,,	,,	4	and 4 p.c. Con. Pref.	114—117	..	3 8 5
4,063,425	,,	Dec. 13	3	Coke 3 p.c. Con. Deb.	93—95	+1	3 3 10
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	Nov. 14	10	Imperial Continental .	212—217	+4	4 13 11
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 28	10	Liverpool United A .	227—229*	..	4 5 6
678,100	,,	,,	7	Do. do. B .	163—172*	..	4 0 0
306,083	,,	Dec. 28	4	Do. do. Deb. Stk.	120—122	..	3 5 7
75,000	5	Dec. 13	6	Malta & Medn., Ltd. .	4¾—5	−¼	5 14 3
560,000	100	Oct. 1	5	Met. of 5 p.c. Deb.	106—109	..	4 11 9
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	104—106	..	4 4 11
541,920	20	Nov. 14	3½	Monte Video, Ltd. . .	9¾—10½	..	6 13 4
717,946	Stk.	Feb. 22	8½	Newc'tle & G'tesh'd Con.	224—226*	+4½	3 16 11
312,855	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	101—102	..	3 8 8
150,000	5	Nov. 29	8	Oriental, Ltd. . .	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	5¾—6¼	..	5 15 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1½	..	4 11 5
					*Ex. div.		

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 28	7	Ottoman, Ltd. . . .	5¼—5¾*	+¼	6 1 9
851,070	10	Oct. 12	7	River Plate Ord. . .	10½—11	+¼	6 10 3
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
250,000	10	Sept. 28	8	San Paulo, Ltd. . . .	11—12	..	6 13 4
135,000	Stk.	Sept. 14	10	Sheffield A	232—236	..	4 4 9
209,984	,,	,,	10	Do. B	232—236	..	4 4 9
523,498	,,	,,	10	Do. C	232—234	..	4 5 6
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.	130—133	..	3 15 2
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb. . .	93—96	..	3 2 6
380,940	Stk.	Nov. 14	5	Southampton Ord. . .	105—110	..	4 10 11
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
120,000	Stk.	Feb. 28	6	Tottenham A. 5 p.c.	112—117*	+2	5 1 8
250,520	,,	,,	4½	and B. 3½ p.c.	84—89*	+1¼	5 0 0
80,100	,,	Dec. 13	4	Edmonton 4 p.c. Deb.	108—113	..	3 10 10
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—102	..	4 18 0
230,000	5	Feb. 28	9	West Ham, 10 p.c. . .	9—10*	+½	4 10 0
147,000	10	,,	6	Do. 7 p.c. . .	11½—12½*	+½	4 16 0
128,984	Stk.	Dec. 28	4	Do. 4 p.c. Deb	108—113	..	3 10 10
				WATER COMPANIES.			
780,499	Stk.	Dec. 28	11	Chelsea, Ord. . . .	298—303	..	3 12 7
150,000	,,	,,	5	Do. 5 p.c. Pref. .	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	142—145	..	3 2 1
175,785	,,	Sept. 28	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
1,720,560	Stk.	Oct. 12	7	East London, Ord. . .	190—195	..	3 11 10
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb. .	145—150	..	3 0 0
797,687	,,	,,	3	Do. 3 p.c. Deb. .	95—97	+1	3 2 6
700,000	50	Dec. 13	8	Grand 10 p.c. max..	108—111	−½	3 12 1
310,000	Stk.	Sept. 28	4	Junction 4 p.c. Deb..	125—130	..	3 1 7
708,000	Stk.	Feb. 14	14	Kent	300—305	+2	4 12 5
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—205	..	3 8 4
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max..	283—288	−2	3 12 5
406,200	100	,,	8	Do. 7½ p.c. max..	208—213	..	3 15 1
350,000	Stk.	Sept. 28	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
500,000	100	Feb. 14	13¾	New River, New Shares	410—415	..	3 6 3
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb..	127—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South- Ord. . .	190—195	..	3 11 10
126,500	100	,,	7	wark 7½ p.c. max.	175—180	..	3 17 9
489,200	Stk.	,,	5	and 5 p.c. Pref. .	155—160	..	3 2 6
1,019,585	,,	Oct. 12	4	Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex. . .	280—290	..	3 9 0
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
200,000	,,	Sept. 14	3	Do. 3 p.c. Deb. .	97—99	..	3 0 7
					*Ex. div.		

that it has been considered the right policy to lay mains everywhere, and wait for consumers to come. This surely is most unsatisfactory, and an extraordinary way to conduct a commercial undertaking. I venture to suggest that all expenditure not absolutely necessary should be stopped until the undertaking pays its way by sufficient consumers being found within the existing area of operations. In the extensions which have been made all the plant and mains should have been increased as far as possible in the correct proportions, for it seems strange to lay mains which, if utilized, cannot be supplied by the generating machinery. Altogether, the electric light undertaking of your city appears to be a most unfortunate venture for the ratepayers, who have to pay for it in many ways besides the direct loss. There is, for instance, the public lighting and the lighting of public buildings now done by electricity instead of gas. The latter, from personal knowledge, I know was efficient; and it is doubtful whether the increased cost of the former justifies its adoption. Any way the cost has to be borne by the rates."

A Board of Trade inquiry was held last Friday by Sir Courtenay Boyle, at the Westminster Town Hall, into the question of whether Electric Lighting Companies and Local Authorities supplying electricity can raise the current from 100 to 200 volts without the consent of the consumer. In 1896 the Board of Trade made regulations for ensuring a proper and sufficient supply of energy, and one of these contained a proviso that no change should be made in the pressure of the supply to any premises which at the date of the regulations were supplied by the undertakers, except with the consent of the consumer. The alteration applied for by the Westminster Electric Supply Corporation, which led to the inquiry, was to substitute for the words "with the consent of the consumer" the words "on such terms and conditions as may be agreed upon between the undertakers and the consumer, or, failing agreement, as may be settled by an arbitrator appointed by the Board of Trade." Mr. Balfour Browne, K.C., Mr. Roger Wallace, K.C., and Mr. D. Warmington appeared for the Corporation; Mr. Moon, K.C., for the Chelsea and Metropolitan Electric Supply Companies; Mr. Alfred Lyttelton, K.C., and Mr. Talbot for the London County Council; and Mr. Danckwerts, K.C., and Mr. J. Walter for the City Corporation; Mr. Littler, K.C., for the Windsor Hotel and the Junior Constitutional Club; Mr. Roskill and Mr. A. B. Cane for the City of London Electric Lighting Company. Mr. Balfour Browne said he appeared, not only for the applying Corporation, but also on behalf of certain Local Authorities, who supported the application for an alteration of the rule. His clients felt the regulation to be oppressive, and thought it ought to be altered in the interest of all parties. In December, 1899, the Corporation intimated to their customers that they would not be able to supply pressure at 100 volts; and the result was that they were now supplying 5500 customers at the 200-volt pressure. Eight customers insisted upon having the 100-volt pressure continued; and the Company had to go on supplying these eight people through separate mains, at great expense and loss, notwithstanding that they were charged 8d. per unit as compared with a little over 4d. per unit to the rest of their customers. The change to the 200 volts had been made almost entirely at the expense of the Corporation. There could be no greater shock by the 200-volt than by the 100-volt current. Mr. Littler submitted that, the Board of Trade having given a vested right in the 100-volt current, it could not be taken from them by the proposed alteration of the regulation. Nothing but an Act of Parliament could take away that right. Mr. Danckwerts said his point was that the Board could not alter the regulation, because it was not a regulation at all. The right of existing consumers was not to be altered without their consent. Sir Courtenay Boyle said for the purposes of that day he decided that the Board had power to alter the regulation. It seemed to enact that the electric lighting companies were to supply at 200 volts save where the consumers previous to March 4, 1896, had 100 volts. The alteration would allow the companies to supply 200 volts. Whether or not it was expedient for the Board to alter the regulation, was a matter for inquiry. Professor Kennedy gave evidence to the effect that there was no more electricity used with the 200-volt pressure than with the 100-volt pressure. There was no danger to the consumer from the increase of voltage; nor was there more risk of a breakdown in the insulation, if proper wiring had been put in. The fittings required overhauling, and in some cases renewal. The inquiry was adjourned till Thursday.

METROPOLITAN WATER COMPANIES' REGULATIONS.

WESTMINSTER TOWN HALL.—Thursday, Feb. 28.

(*Before Mr.* C. PERRIN, M.Inst.C.E., *Chairman, Mr.* T. THOMSON, M.D., *Barrister, and Mr.* E. A. S. FAWCETT, Assoc.M.Inst.C.E.)

The Proposed New Regulations Withdrawn.

It will be remembered that on the conclusion of the proceedings at the last meeting (*ante*, p. 561), a long adjournment was granted to enable the Engineers of the eight Water Companies to confer, with a view to meeting as far as possible the objections of the various Local Authorities of the Metropolis to the regulations proposed. On the re-assembling of the parties to-day,

Mr. CRIPPS said: These amended regulations were, as explained, brought forward to carry out the duty imposed on the Companies by the Act of 1871, to prevent the waste or misuse of water and its undue consumption or contamination, in reference to which duty the Royal Commission reported that the Companies had been remiss. As a matter of public convenience, it was thought better to have one code which involved some alterations in the existing regulations made in 1872. The proposed new regulations related specially to improved fittings which, in the practice of the New River Company, had been found to work satisfactorily in the interests both of the consumer and the Company. The question which has excited most controversy is that of cisterns; these having been advised in the report of Colonel Ducat and

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Dr. Barry, appointed by the Local Government Board in 1895 to inquire into the scarcity of water in the East London district, and emphatically recommended in the report of the Royal Commission. The proposed regulations were framed to give effect to these recommendations. In face, however, of the opposition which the proposals have aroused from the various Local Authorities (owing, as the Companies think, in great part to a misapprehension of the objects sought to be obtained), the Companies propose to ask the Local Government Board not further to proceed with the present inquiry. I make this statement at the outset, because I feel I ought to make it as soon as I can.

Mr. FREEMAN: Speaking on behalf of the London County Council, of course, my friend is entirely within his rights in withdrawing the application which he has brought forward. We have had an opportunity of considering the amended regulations, for which purpose you adjourned; and I am bound to say that, having carefully done so, the London County Council still felt that, in the interests of the public of London and of the ratepayers, they would have had to offer the most strenuous opposition to the bulk of these new regulations. They find that they are supported in this view by an absolute consensus of opinion held by the various representatives of the local districts of the Metropolis, and also by the very weighty authority of my friends representing the City of London. Therefore it is perfectly obvious, I think, that my friend has exercised a wise discretion in the course which he has adopted; and I certainly believe that you have been saved a very long inquiry, because the County Council considered this matter so important that we should have had to call before you engineers, medical officers, and other persons from different great cities, as well as the Metropolis. I think I had a list approaching fifty important witnesses whom it would have been my duty to call. The objects which we had in view have now been obtained; and we are relegated to the code which we believe has worked perfectly satisfactorily in the past. There remains only one thing for me to do. It is perfectly obvious that such an inquiry as this, which has been brought upon us entirely by the action of the Water Companies, and, as we think, entirely under misconception of what their duties and their rights are, has been an expensive matter for the parties who were obliged to oppose in the public interests. I have to make an application, on behalf of the London County Council, that the reasonable costs which we have had to incur in opposing this application may be paid to us by the Companies.

Lord R. CECIL: On behalf of the City of London and the Middlesex County Council, I desire to support the application of my learned friend in all respects. These regulations, which have excited the disapprobation of the whole of the consumers throughout the entire water area of the London Water Companies, have been produced without any consultation—indeed, without being submitted to any of the authorities who represent the consumers. Under these circumstances, I cannot but feel that this is a case in which the Water Companies ought to have acted with more circumspection; and as they have put all these authorities to very large expense, I think they ought to reimburse them.

Several other Counsel appearing made the same application.

Mr. CRIPPS: I have only to say, on behalf of the Water Companies, that, of course, we regret that anyone should have been put, not to unnecessary expense, but to the expense at any rate of having begun the threshing out of what is a very difficult and complicated matter. I hope the question itself may have been advanced by the discussion which has taken place. I agree with Mr. Freeman and Lord R. Cecil that it would be extremely important, if possible, for the Local Authorities and the persons proposing these regulations to come nearer one another before we attempt to thresh out a matter which might involve the calling of fifty witnesses by one of the parties. As regards the costs, I need only say that in this class of public inquiry there are never any costs awarded on either side.

Mr. PERRIN: We shall, of course, submit the arguments on both sides to the Local Government Board.

Mr. FREEMAN: That is all we ask you to do.

The parties then dispersed.

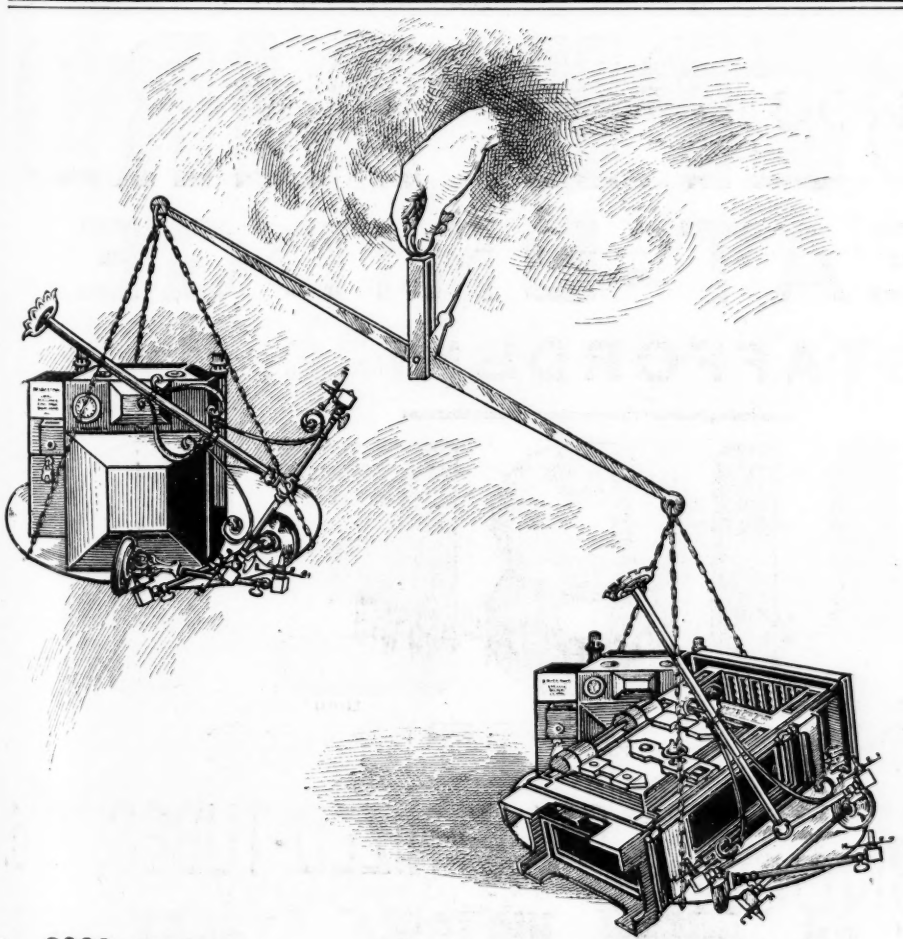
[In the House of Commons last Friday, Mr. Long, in answer to Dr. Macnamara, said that the Local Government Board had no power to require the Water Companies to pay the costs of the inquiry; and he did not consider that if the Board had the power, it would be right to exercise it.]

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At the monthly meeting of the Edinburgh and Leith Gas Commissioners this week, the report by the Engineer (Mr. W. R. Herring) was to the effect that during the month of January there was an increase in the output of gas by 8,528,500 cubic feet, as compared with January of last year; and that since May 16 there had been an increase of 27,724,300 cubic feet. There are 4935 gas-cookers on hire—an increase of 1003 upon the number a year ago. Mr. Purves, the Convener of the Works Committee, in submitting the report, said it showed that they were still going on increasing in a very satisfactory way. The Commissioners are manufacturing sulphate at Granton; and consequently of their residual products (apart from the manufactured articles) they have now only tar for sale. They are inviting tenders for a contract for it, for one, two, or three years. The Commissioners were led into discussions by letters from the Edinburgh Trades Council and the Gas Workers' Union, both of which bodies have taken upon themselves to interfere with the work of the Commissioners. In the letter from the Trades Council, disapproval was expressed of the treatment which a man named Mackay had received at the hands of the Commissioners, and dissatisfaction at the Commissioners' treatment of a letter from the Council. The proper treatment for such a letter would simply have been to throw it into the fire. It was proposed by Sir Andrew M'Donald that it be allowed to lie on the table, which was a more dignified way of doing nothing; but the Commissioners got into conversation on the subject. Mr. Purves said that the man looked after the gasholders at



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Tanfield. The work at that station was being very much increased; and the Committee thought it would be far better to have a younger man than Mackay, who had been a good many years in the situation, to attend to it, and that he should be secured at once, so that he might learn the new duties as they were introduced. Mackay was offered another situation, with 26s. 3d. a week, a free house, and coal and gas; but he refused it. Everything considered, he thought that the man was very fairly, and even generously, treated. Mr. Mallinson said he had had some letters upon this subject; and he thought the facts should be brought out. The man was not dismissed; he was offered a similar situation at the Blandfield station, which he was quite suited for. But he gave up his place, and applied for a pension. The Committee told him that he could do the work at Blandfield, and that he would have there the same money as he had been receiving; but he refused the offer. The letter was allowed to lie on the table. The other letter, from Mr. Blackwood, of the Gas Workers' Union—the terms of which I gave in my "Notes" last week—was read. Mr. Purves pointed out that the alteration in wages would only take effect from that day, when the minutes were adopted. It now became the Engineer's duty to give effect to the resolution of the Commissioners. Bailie Waterston thought it was meant that the alterations were to go back to the date of the application. Sir Andrew M'Donald promptly checked that opinion, and pointed out that, while such a thing was at one time spoken of by some members of the Commission, it was not mentioned on the day when they agreed to the alterations. There is one other step that the Commissioners ought to take—namely, appoint Sir Andrew M'Donald Convener of the Committee. Sir Andrew allows no one to reign beside himself; and that is the sort of man the Commissioners are very much in need of just now. It is time a check was put upon the policy of listening to outside influences. Mr. Blackwood's letter was sent to the Works Committee. Bailie Waterston and Mr. Mallinson gave notice of a motion to consider the advisability of allowing the employees of the Commissioners a full week's holiday, with pay, instead of four days as at present. Mr. Herring said they now had seven days—four consecutive days and three public holidays—throughout the year. Mr. Mallinson explained that the object was that the men should get a week's consecutive holidays, in addition to the public ones. The motion will come up for discussion at the next meeting. The Commissioners, in my opinion, have quite sufficient to do at present, and will have for a good while to come, in the labour attending the translation of their works to Granton, without their being required to consider matters relating to internal economies. Movements outside of the Commission may necessitate the bestowal of time upon such subjects; but any of their own number who raise them are not acting a friendly part to those who bear the burden and heat of the day. At the rate they are going, in a few years the employees will be found amusing themselves by playing at work; and the only real workers will be the Commissioners and the officials.

The annual meeting of the Larkhall Gas Company was held last Friday. A dividend of 5 per cent. was declared; £200 was added to the reserve fund; and £125 was carried forward.

A report by Mr. Robert Gilmour, of Glasgow, on the water supply to Crieff, has been submitted to the Town Council this week. Mr. Gilmour recommends the construction of filters, and a new reservoir to contain 2½ million gallons of water; and also the laying of additional mains. The total cost he estimates at £6845.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March 2.*

Sulphate of Ammonia.—There has been increased activity in the market in Scotland; but elsewhere there has been no improvement, the quotations being £11 to £11 2s. 6d. per ton f.o.b. Leith, £10 17s. 6d. f.o.b. Liverpool, and £10 15s. f.o.b. Hull. The buying continues to be mainly for covering purposes; for although there has been more direct inquiry, the ideas of buyers are somewhat below the level of current prices, and there is not much direct actual business doing. More favourable weather is bringing out home buyers; and a fair amount of business has resulted in this direction. Forward buying is neglected; makers' and consumers' views being too divergent.

Nitrate of Soda is firm at 8s. 4½d. to 8s. 7½d. per cwt., according to quality, on spot.

LONDON, *March 2.*

Tar Products.—There is really no improvement to note in the general depression which has overtaken this market; and, with the exception of a little activity in benzol, there is no encouragement in the outlook for the immediate future. Sales of 90's benzol are reported for March-June delivery which may slightly improve matters; but 50's-90's still appear to be neglected. The position of delivery of benzol, owing to restrictive rates, very materially affects its value. There is a rumour on this market that the large German makes are fully taken up for this year, and that prices may improve in Germany. Tar oils are very dull. Anthracene is quiet; and prices are purely nominal. The demand for naphthalene and salts is rather easier all round. As regards tar, one or two important contracts have been let during the past week; but at fairly reasonable prices.

The average values obtaining during the week are: Tar 14s. to 17s. 6d. Pitch, east coast, 31s.; west coast, 28s. 6d. Benzol, 90's, 10d. to 1s.; 50's, 10½d. to 11½d. Toluol, 1s. 2d. Crude naphtha, 4½d. Solvent naphtha, 1s. 1d. to 1s. 2d. Heavy naphtha, 1s. to 1s. 1d. Creosote, 1d. Heavy oils, 1⅜d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 95s.; salts, 60s. to 80s. Anthracene, "A," 3d.; "B," 2d.

Sulphate of Ammonia.—The market is decidedly quiet, except at Leith, where shippers are pressing for immediate deliveries. Business is reported at from £10 17s. 6d. to £11 1s. 3d. per ton for immediate shipment at this port; but as regards Hull, there are sellers at £10 15s., and several parcels have been offered at £10 17s. 6d. f.o.b. Liverpool without finding buyers. The position as regards Beckton remains unchanged.

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COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The tendency of prices throughout the coal trade continues in a steady downward direction; the only descriptions that are at all maintaining late rates being the better qualities, which still meet with a fairly good demand for house-fire purposes, with no surplus supplies in the market, so far as Lancashire collieries are concerned. For these the local quotations are generally steady at about 16s. to 17s. per ton at the pit for best Wigan Arley, 14s. 6d. to 15s. for seconds Arley and Pemberton four-feet, and 13s. to 14s. for common house coal. There are, however, surplus lots of house coal coming on to the market, from other districts, which are competing in some of the local markets at very much below Lancashire prices. In other descriptions of fuel, there is undoubted easing down upon recent quotations. The lower qualities of round coal are becoming more and more difficult to move, owing to the depression throughout the iron trade and other branches of industry; and the excessively low figures that are just now being quoted for shipment are in themselves a very plain indication of the unsatisfactory condition of the inland markets. For ordinary steam and forge coals, the inland pit prices average about 11s. to 11s. 6d. per ton; but for shipment, steam coal, delivered at the ports on the Mersey, can be bought as low as 12s. 3d. to 12s. 6d. per ton, what are supposed to be the Association list basis rates being altogether nominal. Competition continues keenest in engine fuel; and Lancashire collieries have been cutting into one another's markets to an extent that has compelled retaliatory measures. Manchester firms have, with the commencement of the present month, reduced the list basis 10d. per ton, owing to the competition they have had to meet in some of their own markets with slack coming in from other Lancashire districts. The Lancashire pit prices, taking them all through, average about 8s. to 8s. 6d. per ton at the pit for common sorts, up to 9s. 6d. and 10s. for the best qualities; but there is Derbyshire slack to be bought freely at about 4s. 6d. to 5s., Staffordshire at 5s. 6d. to 6s., and Yorkshire from about 6s. to 8s., according to quality. In coke, prices have been cut very low; unwashed Yorkshire furnace cokes being obtainable at from 10s. to 11s. per ton, with local-made washed furnace cokes quoted from 14s. to 15s. per ton at the ovens. Good local-made foundry cokes are fairly steady at about 26s. per ton at the ovens; but North Country foundry cokes are coming into the district at much below this figure.

Northern Coal Trade.—There is activity in the coal trade, but it is more in the contracting for future than for immediate requirements. The prices are higher than those of a week or so ago, more especially for steam coals; but the advance that is asked seems in some degree to be now checking trade. Best Northumbrian steam coals are about 11s. per ton f.o.b. for early delivery; but for delivery over the season, higher prices are asked, and have been paid in some instances. For steam smalls, the current quotation is now about 5s. 3d. to 5s. 6d. per ton f.o.b. A number of sales have been made for delivery over the shipping season; and for these the price has varied from 5s. 6d. to 6s. per ton f.o.b. The Durham coal trade is relatively weaker than that of Northumberland, there being a very heavy production; and of this, a part that was made into coke is now put on the market as coal. In the gas coal trade, there is an abundant production; and the demand showed the falling off that is usual at this time of the year. In coke, the markets are weak, through a lessened demand. For export, best Durham coke is from 17s. to 18s. per ton f.o.b. Blast-furnace coke is about 13s. 6d. per ton at the furnaces. Gas coke is quieter, though the lessened production should stiffen the market. About 14s. 6d. to 15s. per ton may now be looked on as the f.o.b. price.

Scotch Coal Trade.—The miners have, by a small majority, consented to the reduction of 1s. a day in wages. This may be expected to have an effect on prices. In the same ballot, the men, by a very large majority, expressed themselves in favour of working only five days a week, after the beginning of April. Stocks of coal are increasing. Prices continue to recede. The quotations are: Main 9s. 6d. to 9s. 9d. per ton f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 11s. to 11s. 6d. The shipments for the week amounted to 134,674 tons—a decrease upon the preceding week of 10,902 tons, and upon the corresponding week of last year of 61,304 tons. For the year to date, the total shipments have been 1,166,741 tons—a decrease upon the same period last year of 194,176 tons.

Opposition to the Heckmondwike Gas Bill.—Last Friday a resolution was unanimously passed by a meeting of owners and ratepayers of Cleckheaton, held at the Town Hall, authorizing the District Council to oppose the Bill which is being jointly promoted by the Heckmondwike and Liversedge District Councils for the acquisition of the undertaking of the Heckmondwike Gas Company. The Bill is to authorize a Joint Board to supply gas throughout Heckmondwike and Liversedge; two portions of the latter—viz., Moorbottom and Marsh—being within the statutory gas area of Cleckheaton. Correspondence was read showing that a request for a protective clause had not been satisfactorily met; and therefore the Council felt bound to proceed to opposition to secure their rights.

West Riding Rivers Board and the Leeds Water Bill.—A special meeting of the West Riding Rivers Board was held last Friday, at Leeds, tc consider various Bills now in Parliament to which the Board had suggested certain amendments. One of these was the Leeds Corporation Water Bill, which the Board had requested the promoters to amend so as to provide: (1) That the proper quantity of compensation water be discharged to the rivers and streams proposed to be affected. (2) That the Rivers Board shall have the right to inspect the gauges for measuring the compensation water proposed to be discharged, with power to sue for penalties in case the prescribed quantity is not discharged. (3) For the exclusion from streams of solid matters or polluting discharges arising from the cleansing of filters, filter-beds, &c., proposed to be constructed. The Corporation declined to insert clauses to this effect; and the Rivers Board therefore decided to oppose the Bill in accordance with a former resolution.

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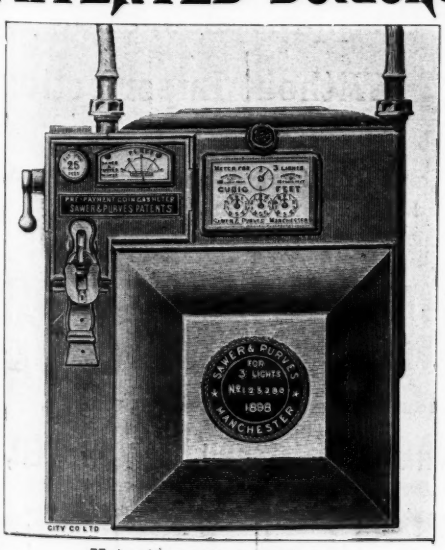

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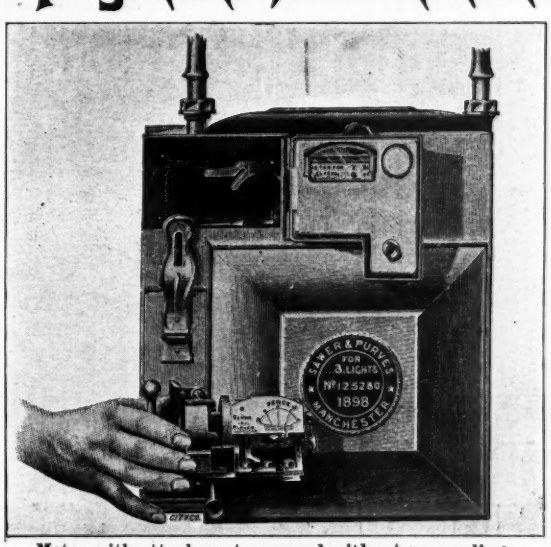

Meter with attachment removed without uncoupling.

Escape from a Gas-Engine Causes an Explosion.—Tom Varley, a master wheelwright, of Pudsey, met with a serious accident last Wednesday morning. He had gone into the works alone, and struck a light to start the gas-engine. Unknown to him, however, the gas had been escaping. He did not detect the smell, and there was an explosion. He was blown violently against the wall. One of his ribs was broken, and he was otherwise injured. He was almost unconscious for a time, but eventually managed to crawl to the door and call for assistance.

Carburetted Water-Gas Plant for Leeds.—Our readers will doubtless remember that the Gas Committee of the Leeds Corporation have for some time past had under consideration the question of introducing water-gas plant at their Meadow Lane station, the new buildings at which have been arranged by the General Manager (Mr. R. H. Townsley) to accommodate it. The matter was deferred, in consequence of the high price of materials, till recently, when tenders and estimates were invited. These were duly sent in, and they came before the Committee at their meeting last Wednesday, when the tender of the Economical Gas Apparatus Construction Company, Limited, was accepted; and it is hoped to have the plant ready for working by next winter. The generating apparatus will cost between £6000 and £7000; but there will be further expenditure, on account of accessory plant, amounting to £10,000 at least. This total ultimate outlay of £16,000 or £17,000 will increase the productive power of the works by 1½ million cubic feet per day.

Mysterious Suffocation by Gas.—At the Bethnal Green Coroner's Court, last Tuesday, an inquiry was opened into the circumstances attending the deaths of Louisa Jane Sharp (36), wife of David Sharp, a cheesemonger's assistant, and her two children, Edith Annie (12) and David William (5), who were found dead at 28, Culham Buildings, Pallissy Street, Bethnal Green. The husband stated that his wife was intemperate. On the previous Friday night, he reached home about a quarter-past ten o'clock. Finding the rooms in darkness, he struck a match, but was unable to light the gas-pendant until he had placed a penny in the slot meter. He then saw his wife lying in an arm-chair, the two dead children being on the bed, and the baby in the bed in the living-room. Failing to arouse his wife and the two elder children, he sat down and smoked his pipe, and then went out and fetched some ale On his return he again failed to rouse his wife, and called a neighbour, who perceived a smell of gas, and told him to go for a doctor. The witness explained that his sense of smell was defective; and, in answer to the Jury, he said the burner was turned on when he first tried to light the gas. Dr. Hewitt Oliver stated that death in each case was due to asphyxia following the inhalation of coal gas. As little as 9 per cent. of coal gas in the atmosphere of a closed room would be enough to kill; but it would require a much greater proportion to cause an explosion. Witness said he understood that the baby was covered over, and this was probably the reason she escaped. The Coroner said that as it had been sworn that complaints of the escaping gas had been made to the officials of the London County Council, and that nothing had been done, the inquiry would be adjourned for a week.

Intensified Gas Lighting in Manchester.—At their meeting last Friday, the Gas Committee of the Manchester Corporation accepted a tender for the fitting up of nine lamps in front of the Royal Infirmary, for an experimental test of lighting by means of intensified gas Welsbach burners will be used, and a Keith compressor will form part of the plant. The nine lamps will, it is expected, furnish light aggregating nearly 10,500-candle power.

Short Strike at the Cork Gas-Works.—Last Thursday all the emyloyees at the Cork Gas-Works, to the number of 100, went out on strike on account of the dismissal of three of their body for disobedience of orders. When the matter became known, there was much apprehension lest the city should be left in darkness. A deputation of the strikers had an interview with the Chairman of the Company (Mr. G. Lynch) in the evening, and explained their grievances. On the Directors undertaking to reinstate the three men sent away, the strikers returned to work.

Projected New Gas-Works for Aberavon.—At a special meeting of the Gas Committee of the Aberavon Town Council last Wednesday, the Manager (Mr. Walter Lister) presented a report and estimate of cost of laying out new gas-works on the site selected some few years since, on which a holder has already been erected. He puts the total cost at £8400, which includes all modern plant and appliances for a well-equipped works. The Committee considered the report; but before coming to a conclusion thereon, they decided to visit the Barry and Aberdare works. The Manager stated that it would be absolutely imperative that the matter of proceeding with the works should be taken in hand at once, in order to meet next winter's requirements.

Lancaster Corporation Gas Supply.—At last Wednesday's meeting of the Lancaster Town Council, the Gas Committee reported that the profits for last year were £1800, from which it was proposed to contribute £1000 in aid of the rates. While unable to make any exact forecast as to the price of coal, or the price obtainable for residuals, the Committee had made an estimate as complete as possible, as the result of which they promised next year to contribute £1250 to the rates. During the year the total increase in the consumption of gas was 5¼ million cubic feet, of which 3 millions were by prepayment meters. The amount collected from this source was £1652, or £553 more than the previous year.

Long Eaton District Council and the Gas-Works.—At the meeting of the Long Eaton District Council last Tuesday, the seal of the Board was attached to a petition to be sent in opposition to the Bill promoted by the Long Eaton Gas Company, who are applying for extended powers and increased capital. A discussion took place as to the advisability of purchasing the gas-works. The Clerk would not venture an opinion as to the cost of opposing the Bill, and it was thought a pity to incur expense to both sides if an amicable arrangement could be made with the Company to purchase their works. After some discussion, a Sub-Committee was appointed to approach the Company to ascertain whether an arrangement could be made for the town to purchase the concern amicably.

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Millom and the Barrow Water Scheme.—At Millom a gathering of ratepayers and owners of property was held last Wednesday, to take into consideration the Bill being promoted by the Barrow Corporation to enable them to draw water from the River Duddon. The meeting considered the proposal would be detrimental to the interests of Millom as a town and port, seeing that it would interfere with the scour in the Duddon, and so prevent sewage from being taken to the sea, and also that navigation would be endangered. It was decided to oppose the Bill.

Petroleum Wells in Egypt.—According to the Cairo correspondent of the "Daily Express," two wells have been sunk by the Petroleum Syndicate at places called Gebel-el-Zeit and Gemsah, on the west coast of the Suez Gulf, about 125 miles south of Suez. One of these wells has been bored to a depth of 2380 feet, and the other to a distance of 2000 feet. In the deeper well three veins of good gas have been struck; and the last 300 feet have been through black, petroleum-bearing sand. The Syndicate are preparing to sink a third well, about 160 miles to the south of Suez, near the shore of the so-called Large Plain, or Southern Plateau, of the Arabian Desert; and all the machinery for this purpose has arrived on the spot.

Elland-cum-Greetland Gas Company and the Local Authorities.—The Directors of the Elland Gas Company have given consideration to the requests of the Elland, Greetland, and Stainland District Councils for certain concessions in connection with the Bill which is being promoted in the present session of Parliament. The Directors decline to reduce the standard price of the gas, but undertake to increase the illuminating power from 14 to 15 candles. They do not, however, desire to sell the undertaking. These replies are considered by the Local Authorities as very unsatisfactory; and opposition is now likely to be persisted in—the Elland ratepayers having given their consent to the District Council taking that course. The Greetland and Stainland Councils have, however, decided to withdraw from active opposition.

Penzance Water Supply.—After considering some half-dozen schemes for improving the water supply, the Sanitary Committee of the Penzance Corporation have recommended the Town Council to sink a well on land near the present reservoir. Alderman Carne, the Chairman of the Committee, explained that enlarging the present reservoir, which was one of the schemes suggested, would not overcome the difficulties of level and want of sufficient pressure. Other schemes suggested were either inadequate or too costly. He did not think Penzance was going to grow to an enormous extent; and if the scheme was sufficient for their present needs, the addition of one or two thousand people would not make a great difference. Mr. A. K. Barnett agreed that if they could provide a supply for the next fifteen or twenty years they might leave their successors to look after the period beyond that. The water from the existing well was on a par with the best water in the kingdom; and that coming from the reservoir was above the average of water supplied from large rivers and subsequently filtered. The recommendation of the Committee was adopted.

Winsford Gas-Works Purchase.—The award of Mr. T. Newbigging in the matter of the purchase of the Winsford Gas-Works by the Urban District Council has been taken up by the Gas Company; the figure being £15,862.

Shoeburyness District Council and the Gas-Works.—A Local Government Board inquiry was held at Shoeburyness last week touching the application of the Urban District Council for a Provisional Order to enable them to acquire the gas undertaking. Opposition was offered, on behalf of the ratepayers, to the suggested scheme of purchase.

Southminster Gas Company.—An extraordinary general meeting of this Company was held last week, when a resolution confirming the provisional agreement entered into by the Directors for the sale of the works to Mr. Worthington Church was unanimously passed. The Directors are, if possible, to give the purchaser possession of the plant on the 25th inst. Proxies representing more than three-fourths of the Company's capital were received in favour of the Board's action in the matter.

Sales of Shares.—Some original £30 shares in the Yarmouth Gas Company were lately sold at £60 each; and 24 new £30 shares in the same Company fetched £49 per share. Ten £10 preference shares in the Yarmouth Water Company sold at £16 2s. 6d. each; and 90 "B" preference £10 shares of the same Company realized £13 15s. to £13 10s. per share. A parcel of original £10 shares and some new ordinary £10 shares were disposed of at £11 10s. apiece. Last Thursday, Messrs. R. Waterman and Sons disposed of five £5 shares in the Sutton Valence Gas Company for £5 10s. each, and £25 of consolidated stock in the Maidstone Gas Company, for £50. Some 4 per cent. preference shares of £10 each in the Maidstone Water Company fetched £10 apiece; some original 10 per cent. shares in the Company, £18 and £18 10s. each; and three ordinary 10 per cent. shares were sold at £16 per share.

Fire at the Ipswich Gas-Works.—The report that a fire was raging at the gas-works excited some consternation in Ipswich last Saturday evening. The Fire Brigade were called at 6.15 p.m., and a general turn-out followed. On reaching the works, it was found that the fire had broken out in a range of buildings, used as carpenters' and fitters' shops, adjoining the stables, and backing on to the smiths' shop at the Orwell Works. The fire was discovered by the watchman for Messrs. Ransomes, Sims, and Jefferies, and their brigade assembled promptly upon the alarm being raised. By dint of strenuous work, aided by an excellent supply of water, a splendid "stop" was quickly effected. Meanwhile, the Orwell Works Brigade rendered good service by protecting the smiths' shop adjoining the burning premises. All danger of the fire spreading was over in about an hour; and, after about another hour's cooling down, the Corporation Brigade were withdrawn, though three men were left in charge all night. The building in which the outbreak occurred comprised two storeys, and was about 60 feet long by 20 feet wide; and of this range some 40 feet was practically burnt out.

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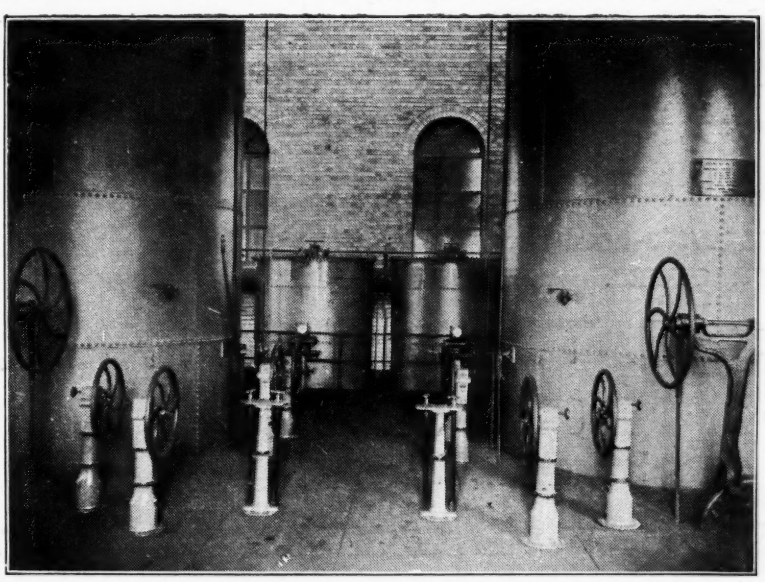

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Incandescent Gas Lighting at Newhaven.—At the last monthly meeting of the Newhaven District Council, the Clerk (Mr. E. Knightley) was instructed, on the recommendation of the Sanitary and Lighting Committee, to reply to a letter received from the Secretary of the Gas Company, stating that the Council did not accept their offer of the 12 incandescent lanterns and burners erected by them in the High Street, and to issue an order on the New Sunlight Incandescent Company for 12 lanterns and burners; and the Surveyor was instructed to have them fixed as soon as the Gas Company have removed their lamps.

Morecambe Gas Purchase.—For some time the Morecambe District Council have been endeavouring to negotiate a loan for the purchase of the undertaking of the Morecambe Gas Company; but so far their efforts have proved futile. The purchase price agreed upon by the parties was the sum of £141,000. The Council now intend issuing mortgage bonds, in lieu of cash payment, bearing 4 per cent. interest, payable half yearly and redeemable at par in five years. The Directors of the Company propose to distribute the £141,000 among the shareholders as follows: In respect of £100 6 per cent. preference stock, £220; £100 ordinary stock, £515; £100 new ordinary stock, £413 13s. 9d. This will absorb £140,786.

Haywards Heath Water Supply.—The inquiry held last Thursday, by Colonel J. T. Marsh, R.E., into the application of the Cuckfield Rural Council to borrow £11,000 for works of water supply was unopposed. The more interesting of the facts were as follows: The water-works were purchased by the Rural District Council in 1898; the loans for the purpose already amounting to £74,996. The present application was made with the view of extending the mains. The water-tower was estimated to cost £2500, whereas it actually had cost £4560. There had been no alteration in the plans, but the increased difference was due to the enormous rise in the prices of materials and labour, which took place in the past and the preceding years. This, together with £200 for the cost of the site, not included in the original estimate, left an excess of £2262. The lowest tender for the work was accepted. Another case of actual cost exceeding the estimate was that of the pumps. The Worthington pumps were reckoned to cost £250, but they actually cost £435. The boring had gone through 320 feet of clay, and they had now got into sandstone. They had obtained an immense supply of water in the new well sunk close to the old one, but not from the old well; and there was no connection at present between the two. All the mains were in the district of supply, but not in that of the Rural District Council. Some of the extensions would be carried into Haywards Heath, which was one of the best consumers, but not a contributing parish.

The Municipal Council of Syracuse, Sicily, have approved of a project for the conveyance of water from the sources of the Rivers Ferita and Scerara, in the Palazzo Adriano territory, to the town. It is understood that, by spending a sum of 400,000 lire, a supply of 220,000 gallons of water daily would be secured, which would be in effect equal to about 20 gallons per day per inhabitant.

At the annual meeting of the Harwich Gas Company last Wednesday, it was reported that, in view of the fact that during the past six years the Company's manufacture of gas had doubled, it had become urgently necessary to reconstruct the retort-stack, and, under the advice of Mr. J. T. Jolliffe, of Ipswich, a contract had been entered into with Mr. J. H. Robus for carrying out the work.

The New York correspondent of the "Daily Express" says that "oil booms are becoming so common as to excite little interest outside of their immediate localities. New fields have been discovered in many sections, and investors are excited over the opportunities for pumping fortunes from underground. At Kern River, California, newly-discovered oil lands are selling for £2000 per acre. Texas and New Mexico are being overrun by prospectors, who have reports of daily finds to encourage them. Some wonderful oil fields have been discovered in Alaska, in the neighbourhood of Cape Nome."

It will be seen by an announcement which appears elsewhere that the Southwark and Vauxhall Water Company are inviting tenders for an issue of 3 per cent. debenture stock, authorized for intercommunication works under the provisions of the Metropolis Water Act, 1899. It will be redeemable at par, at the option of the Company, 25 years from the date of issue. The interest on this stock is borne by the eight Metropolitan Water Companies in varying proportions, and ranks *pari passu* with the interest on the debenture "B" stock.

The Directors of the Davis Gas-Stove Company, in their report presented at the first annual meeting of the Company held yesterday, stated that the only profits available for distribution were those which had accrued since the date of registration (the 22nd of May). They amounted to a net sum of £14,151, from which had to be deducted £2690 for interest on purchase-money, and £1456 for dividend on preference shares paid to Dec. 31, 1900. There then remained a balance of £10,005 1s., which it was proposed to apportion as follows: £3626 for profit not divisible, to be used in reduction of the goodwill account; £368 payable to the Directors and Managers; £2161 to pay a dividend at the rate of 8 per cent. per annum on the ordinary shares from the dates of the receipt of the various calls to Dec. 30; to place £2000 to the reserve fund; and to carry forward the balance of £1850.

At the ordinary general meeting of John Wright and Eagle Range, Limited, next Thursday, the Directors will report that the profit for the year, after strengthening the internal reserves, and charging Directors' remuneration, the expenses of amalgamation, and depreciation on the buildings and plant, amounts to £44,324. After adding the balance of £5211 brought forward, and deducting the interim dividends (£12,794) paid in September, there remains for disposal the sum of £36,741, which the Directors recommend should be appropriated as follows: To pay a dividend at the rate of 6 per cent. per annum for the half year on the preference shares, less income-tax, £2422; to pay a dividend of 2s. 6d. per share on the ordinary shares, free of income-tax, making, with the interim dividend, 20 per cent. for the year, £17,250; to carry to the reserve (raising the fund to £25,000) £10,500; and to carry forward £6569.

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CONDENSERS. **CRIPPS'S GRID-VALVE** TAR-BURNERS.

SIEVES. For bye-passing the lower layer in Purifiers. VALVES.

TYSOE'S SELF-SEALING MOUTHPIECES.

Tar-Distilling Plants. Claus' Sulphur-Recovery Plants.

SULPHATE OF AMMONIA PLANTS.

The Directors of the British Gaslight Company, Limited, propose to recommend a dividend at the rate of 10 per cent. per annum for the half year ended Dec. 31, free of income-tax.

The Chesterfield Gas and Water Board have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for a three-lift gasholder, with guide-framing, to be erected to suit an existing tank.

The Stanhope gold medal for the most deserving case of the past year has been awarded by the Royal Humane Society to William Allen, employed by the Wear Fuel Company, Sunderland, for his gallantry in rescuing three men who were overcome by gaseous fumes in a tar-still at Sunderland on the 15th of March. Allen had to enter the still three times in order to save the men—each time risking his life.

At the recent annual meeting of the Carmarthen Gas Company, the Chairman (Mr. C. W. Jones) spoke in complimentary terms of the Manager, Mr. B. A. Lewis, who, he said, was always ready to accept any suggestion put forward. He moved a vote of thanks to him for the care, attention, and assiduity he had shown in carrying on the works. Sir Lewis Morris, in supporting the motion, said they ought to be proud of Mr. Lewis, not only as a gas manager, but as an artist. He felt certain that the more irons one had in the fire, and the greater the number of ways one could distinguish oneself, the better it was.

The working of old-age pensions in Victoria, says the Melbourne correspondent of "The Times," is very costly. "The amount provided was based on the estimate that there would be 6000 applications; and it is now found that 15,000 persons are applying. The annual cost is £300,000. The ex-Premier, Sir George Turner, is blamed for agreeing to the increase of the weekly payment from 7s. to 10s., and for not listening to warnings that the money provided was insufficient. Sir George replies that applications from persons hitherto supported by their children were not contemplated, but that the Act does not prohibit such applications. The Premier, Mr. Peacock, states that the Act is a temporary measure, and will be re-enacted next session with amendments framed in the light of experience." The foregoing may be of interest in connection with the fact that there are several Bills dealing with this subject already before the House of Commons.

The Belle Vue Gardens, Manchester, was the scene of a very pleasant gathering on Saturday, the 23rd ult., when, at the invitation of Mr. and Mrs. Robert Dempster, the whole of the employees of Messrs. R. & J. Dempster, Limited, partook of high tea, and spent a social evening together, in celebration of the coming of age of Miss Dempster. Upwards of 800 tickets were issued. The chair was occupied by Mr. R. A. Hepworth, the Manager of the firm, who, in proposing "The Health of Miss Dempster," stated that it was her cherished desire that, on attaining her majority, the whole of the employees, their wives and sweethearts, should spend a pleasant day together, on condition that they refrained from making her any present in return. With the exception of a magnificent basket of flowers, they had obeyed her command. He concluded a very happy speech by asking all to join in the hope that Miss Dempster might be granted the best of health, and every pleasure her future life could bring her. The Chairman's remarks were very cordially received. Mr. W. F. Perkins expressed Miss Dempster's thanks for the gift and for the kind wishes by which it was accompanied. Mr. J. Bowes proposed "The Firm of Messrs. R. & J. Dempster, Limited," and dwelt upon the benefit the district had derived from their settlement in it. He asked all present to wish them long life, plenty of trade, and prosperity. Mr. Charles Dempster responded, and said a great deal of the firm's success was due to their able and respected Manager, assisted by a clever staff and heads of departments. A vote of thanks was accorded to Mr. and Mrs. R. Dempster, and acknowledged by the former. In the course of his remarks, he impressed upon the apprentices the importance of technical education, and devotion to their trade while young, unless they wished to see their country following instead of leading. Thanks were also accorded to the Chairman, to the ladies and gentlemen who had contributed the musical and other numbers to the programme, and to Mr. J. W. Scott, who had organized the very enjoyable gathering, which was brought to a close by the singing of "Auld Lang Syne."

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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For all Joints in connection with Oil Gas Plant and Sulphate Plant.
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For all Tar Joints.
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Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
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BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see p. 647.]

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

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H. GREENE & SONS, Ltd., are pre-pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

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Send for full Particulars to
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Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

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THE Continental Incandescent Gas-light Company, Limited, have OPENED SHOWROOMS at 92-96, Bishopsgate Street Without, E.C. Travellers and Trade Supplied.

WANTED, a Situation in Gas or Water Works, as MAIN and SERVICE LAYER. Good References.
Address, F. VINCENT, Lower Morden, SURREY.

A GAS-FITTER is desirous of obtaining a SITUATION in the Automatic House Fitting Department. Willing to assist in General Fitting. Good Testimonials.
Address YATES, Whitehall Street, AYLESBURY.

A GENTLEMAN who is at present REPRESENTING a large GAS-STOVE MANUFACTURER, having a sound Connection, desires to make a change, and would like to negotiate with Firm in same business.
Address No. 3647, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

MANAGER of very important Gas- Works in West of France would receive, from 20th July to end September, A BOY 12-15 Years of Age in exchange for one of his own (aged 13), with the object of LEARNING THE LANGUAGE.
Address M. BIGEARD, Cie du Gaz, ANGERS.

WANTED, a Manager for the Bally-mena and Harryville Gaslight Company, Ltd.
Applications, accompanied by Testimonials, and stating Salary expected, to be sent to Mr. SAMUEL HOOD, Chairman, Ballymena and Harryville Gaslight Company, Mill Street, BALLYMENA.

WANTED, by a Gas Company in the South of England, for high-class Indoor Work, several good FITTERS. Wages 33s. to 35s. per week, according to capabilities. Overtime extra. Permanencies.
Experienced men only need apply to No. 3654, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a thoroughly experienced Man to act as CARBONIZING FOREMAN, and to make himself generally useful, in a Works near London. Make of Gas, 100 Millions. Liberal Wages to a suitable person.
Apply, by letter, to No. 3655, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, by a Factor, several TRAVELLERS (of good address) well known to Gas Engineers. State District known in, what Goods previously travelled in, and with what success, and approximate Salary and Expenses expected.
Apply, by letter, to No. 3653, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Second-hand Gas-HOLDER, 18 ft. diameter by about 10 ft. deep.
Address JAMES GIBSON, Gas-Works, BEVERLEY.

OLD Gas Cooking-Stoves purchased in any Condition. State Size and Quantity.
Address No. 3652, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, good second-hand Purifier, 12 feet square by 4 feet deep, with 12-inch Connections.
State Price and where it can be inspected, to C. FOSTER VEEVERS, Gas-Works, Northfleet, KENT.

WANTED, a second-hand Station Meter in good Condition. Capacity 8000 or 10,000 cubic feet per hour, with Valves and Connections.
Full Particulars and Price to GEO. MEAD ROBINS, Gas Offices, Sutton, SURREY.

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TO clear adverse Contracts, will make SPECIAL PRICES for quick deliveries.
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FOR SALE—Four Purifiers 10 feet square, complete with Centre-Valve, Connections, and Lifting Crabs and Girders. To be seen at the Cleethorpes Gas-Works.
For Particulars, please apply to R. DEMPSTER & SONS, LIMITED, ELLAND.

FOR SALE, cheap—One, Two, or Three PURIFIERS, 8 ft. square by 4 ft. deep, in good condition, with Valves, Connections, and Lifting Gear.
INQUIRIES for all kinds of SECOND-HAND GAS PLANT will also be esteemed by SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

A SET of Four Second-Hand Purifiers wanted, with an area of not less than 190 feet each.
Offers, with full Particulars, to be sent in the first instance to No. 3603, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Offers for Four Purifiers, 12 feet square, 4 ft. 6 in. deep, with 10-inch Connections, Donkin Valves, Lifting Apparatus, &c., as fixed.
Can be seen in use by appointment, near London.
Address No. 3639, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PURIFIERS FOR SALE.

THE Waterford Gas Company, in con-sequence of Extensions, have FOR SALE Two 10 feet square PURIFIERS, complete with 10-inch Four-Way Valve Connections. Lutes 18 inches deep. May be inspected at the Works.
Apply to W. B. RONAN, the Company's Secretary, 94, South Mall, CORK.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

TO BE LET on Hire—
PULSOMETER, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe $\frac{3}{4}$ in. diameter. Discharge 10,000 Gallons per hour.

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EXHAUSTER for 63,000 feet per hour, with Steam-Engine, by Gwynne. In excellent condition. Replaced by 200,000 feet.
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J. FIRTH BLAKELEY & CO., Gas En-gineers and Contractors, THORNHILL, DEWSBURY, are the largest Buyers and Dealers in discarded Gas Plant, and have always a large Stock of good Plant to select from, among which the following may be mentioned:—
RETORT IRONWORK, MODERN HYDRAULICS, numerous sizes.
CONDENSERS, up to 12-inch Verticals, 16-inch Annulars.
SCRUBBERS, 3 ft. 6 in. diameter to 7 ft. diameter, with Boards.
WASHERS, "Livesey's," "Clapham's," and "Holmes'" Patents.
EXHAUSTERS, 2000 to 60,000 cubic feet per hour, with Engines.
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STATION METERS and GOVERNORS, 4, 6, 10, and 12 inch.
GASHOLDERS, 12 ft. by 8 ft., 20 ft. by 10 ft., 25 ft. by 12 ft., 40 ft. by 16 ft., 50 ft. by 20 ft. guaranteed.
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THE Dorking Gas Company have for DISPOSAL 36 6-inch H DIP and ASCENSION PIPES, Six HYDRAULIC MAINS, Twelve 21 in. by 15 in. and 24 18-inch diameter Tangyes Patent MOUTHPIECES and LIDS in good condition.
The whole can be seen on application to the MANAGER.

GAS GOVERNORS for Sale:—
Two 1½-inch STOTT GOVERNORS.
Four 1-inch " "
Three ¾-inch " "
One ¾-inch " "
One 12-horse power BRADBEAR GOVERNOR.
One 8-horse power " "
One 6-horse power " "
T. M. DAFFERN, 20, High Street, COVENTRY.

GAS-METERS for Sale:—
Three 3-light METERS.
Two 10-light "
Two 30-light "
Three 5-light "
Three 20-light "
One 50-light "
Also the following SECOND-HAND METERS:—
One 300-light METER.
One 10-light "
Two 5-light "
T. M. DAFFERN, 20, High Street, COVENTRY.

URBAN DISTRICT COUNCIL OF PADIHAM.

THE Gas Committee of the above Council invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR to be produced at their Gas-Works during the Year ending March 31, 1902.
Sealed Tenders, addressed to the Chairman of the Gas Committee, must be sent to me not later than Saturday, March 16, 1901; and for Particulars apply to
J. R. SMITH,
Clerk to the District Council.
Padiham, Feb. 27, 1901.

URBAN DISTRICT OF MILFORD HAVEN.

TENDERS FOR GAS COAL.

THE Milford Haven Urban District Council are prepared to receive TENDERS for about 800 Tons of large GAS COAL, about 50 Tons of CANNEL COAL, and also about 100 Tons of BITUMINOUS STEAM COAL, to be delivered between the 1st of April, 1901, and the 31st of March, 1902. The whole of the Coal to be fresh-hewn, clean, and free from impurities.
Further Particulars and Forms of Tender can be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tender for Coal," addressed to the Chairman, Gas and Water Works Committee, to be sent in not later than the 11th of March inst.
The Council do not bind themselves to accept the lowest or any Tender.
By order,
THOMAS H. LEWIS,
Clerk.
Milford Haven,
March 1, 1901.

URBAN DISTRICT COUNCIL OF BUXTON.
(GAS DEPARTMENT.)

EXCAVATION FOR GASHOLDER TANK AND RETAINING WALL.

THE Gas Committee of the above Council are prepared to receive TENDERS for the Materials and Work required in the Construction of a RETAINING WALL and EXCAVATION, &c., for a Gasholder Tank at their Gas-Works, Ashwood Dale, Buxton.
Copies of Specification and Bill of Quantities may be obtained from, and Plans seen at, the Office of Mr. Harold Barker, Gas Engineer, Town Hall, Buxton, on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Excavation, &c., Contract No. 1," to be delivered to the undersigned not later than Saturday, the 23rd day of March, 1901.
The Committee do not bind themselves to accept the lowest or any Tender.
(Signed) JOSIAH TAYLOR,
Clerk to the Council.
Town Hall, Buxton,
Feb. 27, 1901.

URBAN DISTRICT COUNCIL OF BUXTON.
(GAS DEPARTMENT.)

GASHOLDER AND STEEL TANK.

THE Gas Committee of the above Council are prepared to receive TENDERS for the Construction of a STEEL GASHOLDER TANK, 102 feet diameter by 24 ft. 6 in. deep, also for a TELESCOPIC GASHOLDER, Inlet and Outlet Pipes, and Appurtenances, to be erected on the Gas-Works, Buxton.
Copies of Specification and Form of Tender may be obtained, and Plans seen, at the Office of Mr. Harold Barker, Gas Engineer, Town Hall, Buxton, on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
The Committee reserve the right to modify the above-mentioned Specification and Plans so as to enable makers of Patent Cable and Spiral-Guided Gasholders, and other persons wishing to avail themselves of patent or other rights or facilities, to Tender in accordance with the Contractors' own designs. Such alternative designs, with complete Plans and Specifications, to be submitted to the Engineer and approved by him before the Tenders are made.
Sealed Tenders, endorsed "Tank and Holder, Contract No. 2," to be delivered to the undersigned not later than Saturday, March 23, 1901.
The Committee do not bind themselves to accept the lowest or any Tender.
(Signed) JOSIAH TAYLOR,
Clerk to the Council.
Town Hall, Buxton,
Feb. 27, 1901.

THE Urban District Council of Hindley are prepared to receive TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Twelve Months.
Full Particulars, with Form of Tender, can be obtained on application to Mr. William Dickinson, Gas and Water Manager.
Sealed Tenders, endorsed "Tender for Tar and Ammoniacal Liquor," to be lodged with the undersigned not later than Monday, March 18, 1901.
By order,
STEPHEN HOLT,
Clerk to the Council.
Offices: Cross Street,
Hindley, Feb. 28, 1901.

EDINBURGH AND LEITH CORPORATIONS GAS COMMISSIONERS.

TENDERS FOR TAR.

THE Commissioners are prepared to receive TENDERS for the removal of their surplus TAR for One, Two, or Three Years from the Edinburgh and Leith Gas-Works, and amounting to about 10,000 Tons per annum.
The Commissioners will load the Tar into the Contractors' Tank-Waggons at either of the Gas-Works; the Contractor providing the Waggons, and paying the transit thereof to and fro.
The Commissioners are prepared to make the Contract on the basis of the values of the Tar Products ascertained monthly by Arbitration, or on the basis of so much per Ton of Tar.
The Commissioners do not bind themselves to accept the highest or any Offer.
Tenders are to be delivered to the undersigned on or before Ten a.m. on the 25th of March, 1901.
JAMES M'G. JACK,
Clerk.
25, Waterloo Place,
Edinburgh, Feb. 26, 1901.

LIVERPOOL UNITED GASLIGHT COMPANY.

TAR.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the TAR produced at their several Works for a period of One Year, from July 1, 1901.
The quantities of Tar produced per annum are estimated to be as follow; but the same cannot be guaranteed, and may be more or less:—

At the Athol Street Works, about			570,000	gallons.
"	Eccles Street	" "	500,000	"
"	Caryl Street	" "	400,000	"
"	Wavertree	" "	550,000	"
"	Linacre	" "	2,200,000	"
"	Garston	" "	350,000	"

The Tenders may be for the whole, or for one or more of the Works separately, or for a definite quantity from Linacre Works.
Forms of Tender and full Particulars may be obtained on application to the undersigned.
Tenders, sealed and endorsed "Tender for Tar," are to be delivered here not later than the 22nd of March, 1901.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
By order,
WILLIAM KING,
Engineer.
Gas Office: Duke Street, Liverpool,
March 2, 1901.

DONCASTER CORPORATION.

THE Gas Committee of the Borough of Doncaster are prepared to receive TENDERS for the purchase of Two STEAM-BOILERS, with Furnace Doors and all Fittings complete. No. 1 is 15 ft. 1 in. long by 5 ft. 1 in. diameter, with Flue 2 ft. 6 in. diameter and Dome 2 ft. by 2 ft. No. 2 is 12 ft. 4 in. long by 4 ft. 2 in. diameter, with Flue 2 ft. 2 in. diameter and Dome 1 ft. 8 in. by 2 ft. 3 in. They are in good order, and have been removed to be replaced by larger ones, and now lay in the open yard ready for inspection.
Tenders must state the Price in one lump sum for each Boiler, and the Purchaser will have to remove the same from the Gas-Works immediately, at his own cost and risk.
Offers can also be received for the purchase of about 10 Tons, more or less, of OLD METAL, at a price per Ton on the Works.
The Corporation also have a HEATING BOILER, one of Hartley and Sugden's "Climax," 6 ft. by 3 ft. 6 in. by 3 ft. 6 in., which has been used at their Hyde Park Schools since 1896, and is now removed to make room for larger, to be sold as per the above terms.
Tenders must be sent in under seal to the Chairman of the Gas Committee, not later than Twelve Noon, March 8, 1901, endorsed "Tender for Boiler."
The Committee do not bind themselves to accept the highest or any Tender.
Permission to view, or any other Information, may be obtained on application to the undersigned.
R. BRIDGE,
Engineer.
Gas-Works, Doncaster,
Feb. 25, 1901.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 20th inst., at Twelve o'clock precisely, to transact the usual Business, and to declare a Dividend for the Half Year ended the 31st of December last.
Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 9th and RE-OPENED on the 21st inst.
By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.
Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 1, 1901.

THE Corporation of Middleton are prepared to receive TENDERS for the supply of SUNDRY STORES for One Year ending the 31st of March, 1902, consisting of the following: LIME, VITRIOL, METERS, BRASS MAIN COCKS, TUBES and FITTINGS, FIRE-CLAY GOODS, and the following VARIOUS GOODS:

GROUP 1—OILS (Gas-Engine, Cylinder, Engine, Boiled, Exhauster, Conveyor Lubricant, and Turpentine), SULPHATE OF AMMONIA BAGS, RETORT CEMENT, RED and WHITE LEAD, SPUN YARN, and TARRED YARN.

GROUP 2—WASTE and CLEANING CLOTHS, YARD BASS BROOMS, BUCKETS, SHOVELS, FILES, and COKE FORKS.

And also for the purchase of the surplus TAR made at their Gas-Works during the same period (about 700 Tons).

Further Particulars, Specifications, and probable Quantities may be obtained on application to Mr. T. Duxbury, Gas Engineer.

Tenders, addressed to the Chairman of the Gas, &c., Committee, and endorsed "Tender for .. . .," to be delivered at my Office on or before Wednesday, the 13th of March, 1901.

The Corporation do not bind themselves to accept the lowest or any Tender.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
Feb. 26, 1901.

COLNE VALLEY WATER COMPANY.

NOTICE is Hereby Given, that it is the intention of the Directors of the above Company to SELL BY TENDER 1800 NEW ORDINARY SHARES of £10 each. Minimum Price, £19 per Share.

Particulars, with Forms of Tender, can be obtained at the Company's Office; and Tenders must be sent in on or before March 16, 1901.

By order,
W. VERINI,
Secretary.

Office: Bushey, Watford,
March 4, 1901.

SOUTHWARK AND VAUXHALL WATER COMPANY.

SALE BY TENDER OF THREE PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of the Southwark and Vauxhall Water Company to SELL BY TENDER, to be received at the Company's Offices, Southwark Bridge Road, S.E., not later than Twelve o'clock (Noon) on Tuesday, March 12, 1901, such amount of THREE PER CENT. DEBENTURE STOCK as will produce £47,000.

The Stock now for Sale is the Capital authorized to be raised for Intercommunication Works under the Provisions of the Metropolis Water Act, 1899, and will be entitled from the 31st of March, 1901, to Interest at the rate of £3 per cent. per annum.

It will be known as Intercommunication Debenture Stock, and may be redeemed at par at any time after the expiration of Twenty-Five Years from the date of issue, subject to Six Months' previous notice of the intention to redeem.

This Stock not only ranks for Interest *pari passu* with the Interest on the Debenture Stock "B" of the Company, but under the Provisions of the Metropolis Water Act, 1899, the Interest is to be borne by the Eight Metropolitan Water Companies in varying proportions. It is a lawful Investment for Trustees.

For Particulars, Forms, and Conditions of Tender, apply at the Office of the Company, Southwark Bridge Road, London, S.E.

By order of the Board of Directors,
MONTAGUE WATTS,
Secretary.

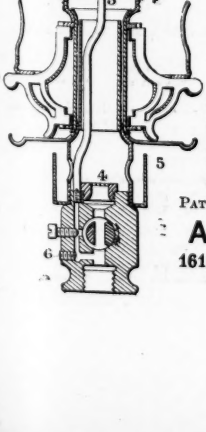
Southwark Bridge Road, S.E.,
March 1, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.



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It is the fruit of 33 years of practical and professional experience. It is very painstaking and complete. A large portion of the matter is adaptable to the book-keeping of Local Authorities. A thoroughly practical and excellent work.—*Glasgow Herald.*

For financial intricacy, the keeping of Gas Companies' accounts is hard to equal, and the publication of "Gas Companies' Book-keeping" is timely. This treatise deals in the most exhaustive manner with the keeping of gas accounts.—*Daily Mail.*

There can be no doubt of the practical usefulness of this work to everyone concerned in the keeping of gas accounts. It is well printed on excellent paper, and neatly bound in cloth.—*Huddersfield Examiner.*

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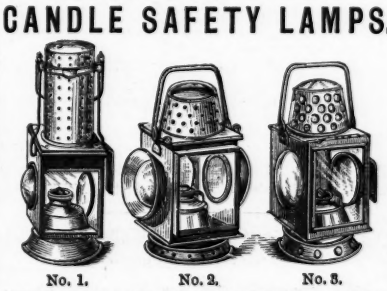

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Yield of Gas per Ton . .	**10,500 Cub. Ft.**
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Coke (of good quality) . .	**67·5 per Cent.**
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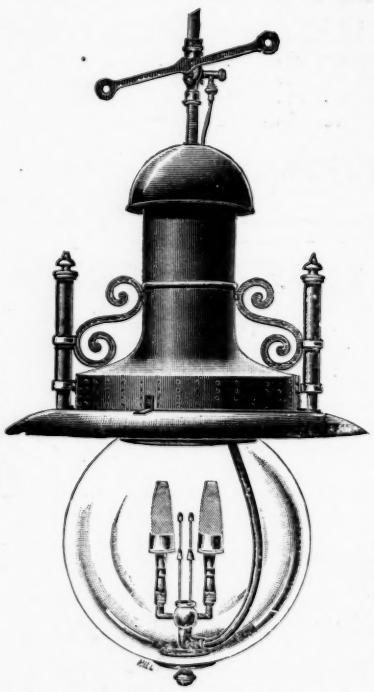

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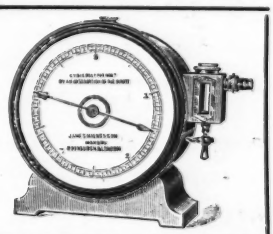

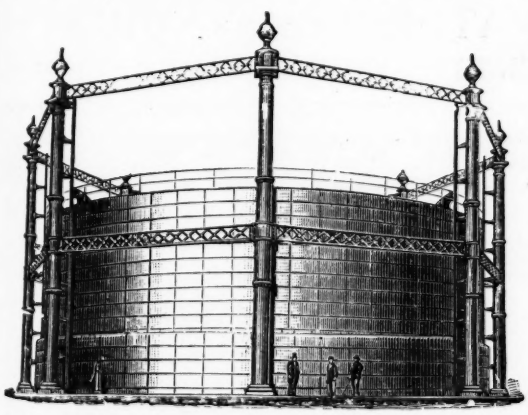

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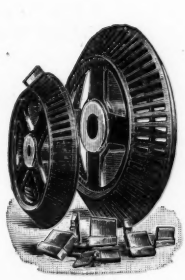

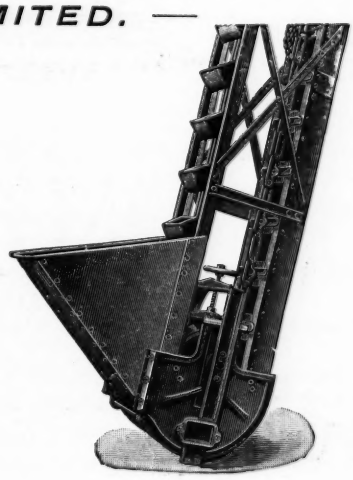

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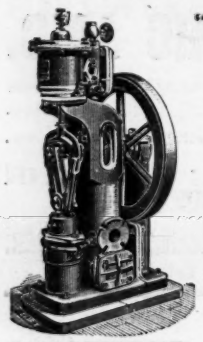

Fig. 705. "SINGLE RAM" STEAM-PUMP.

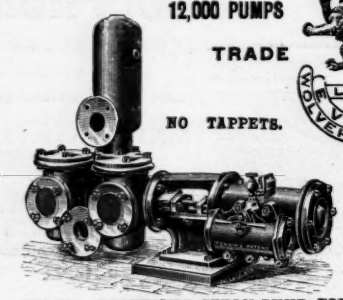

Fig. 893. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

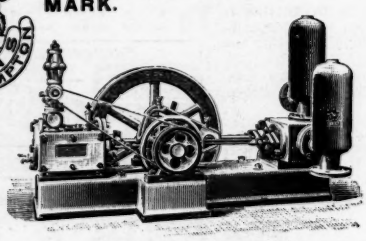

Fig. 688. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

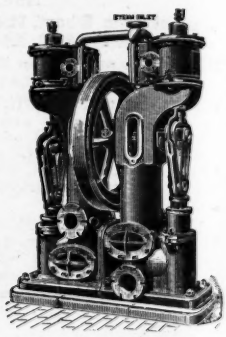

Fig. 772. "DOUBLE-RAM" STEAM-PUMP.

THE DELLWIK-FLEISCHER WATER-GAS PROCESS

For Increasing the Capacity of Coal-Gas Works, also for Incandescent Lighting, Driving of Gas-Engines, and Manufacturing Purposes.

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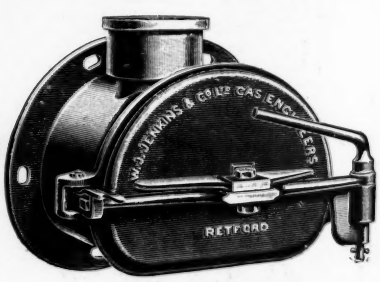

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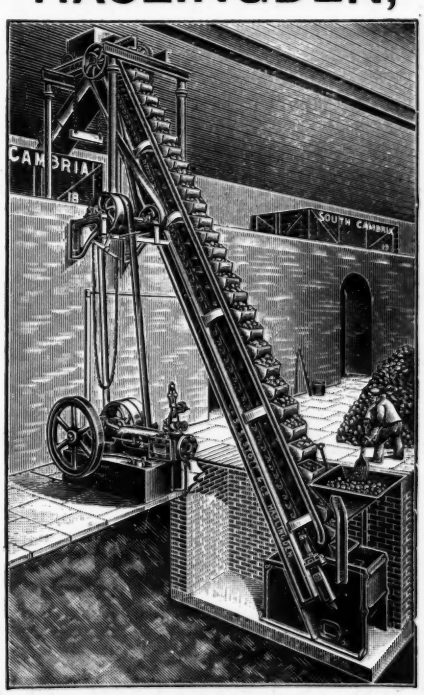

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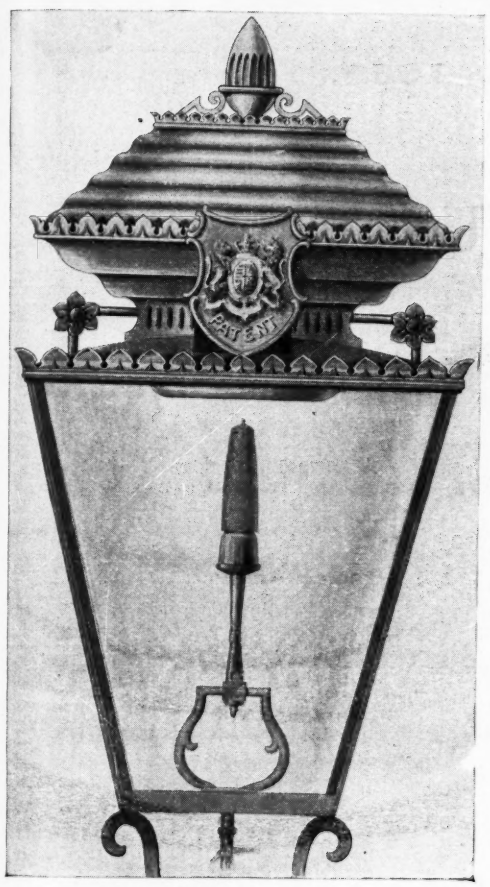

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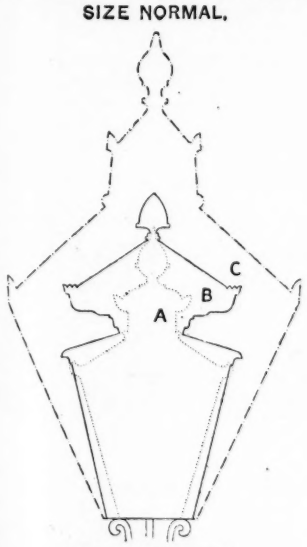

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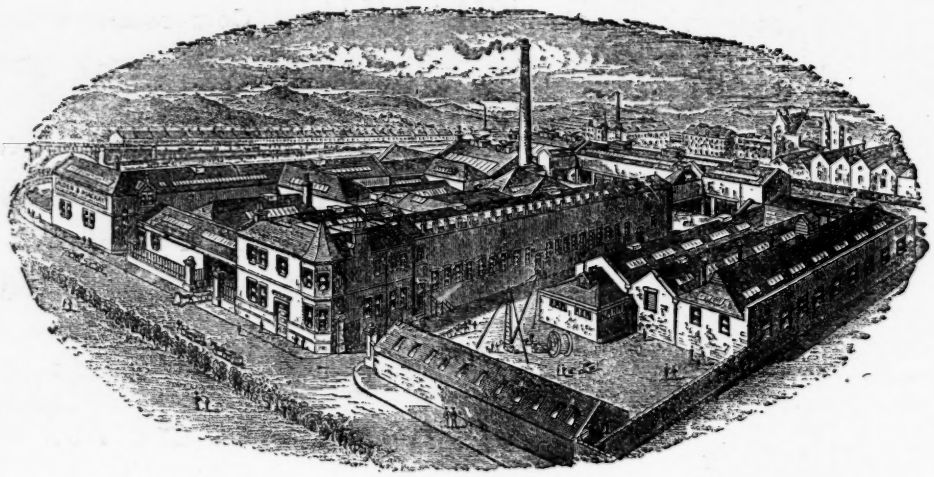

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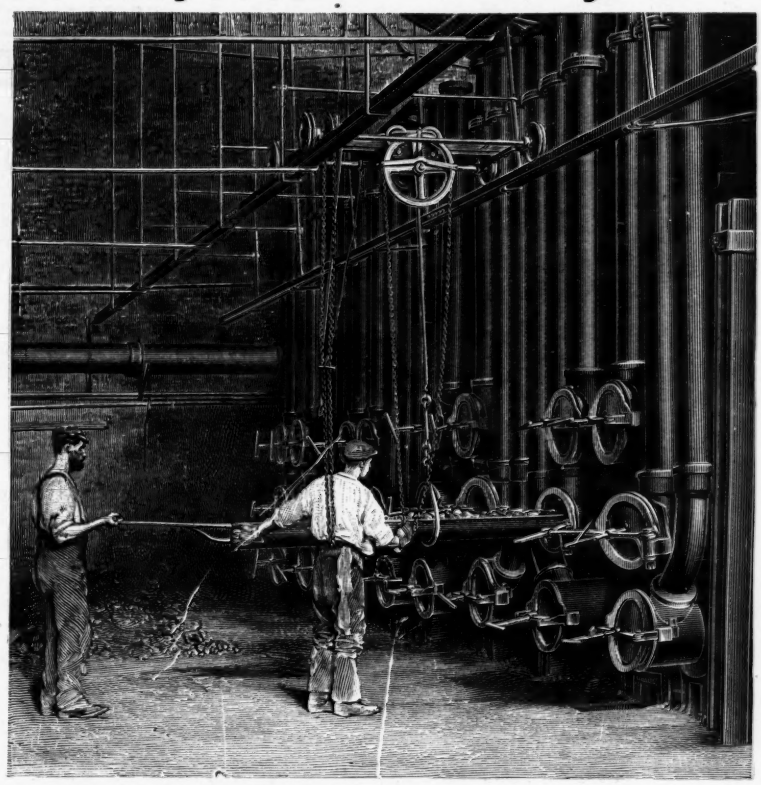

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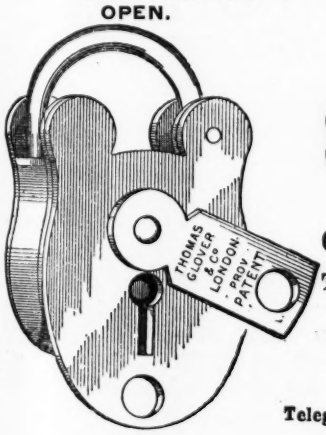

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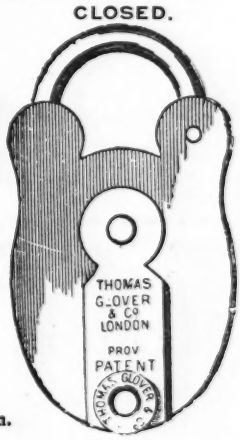

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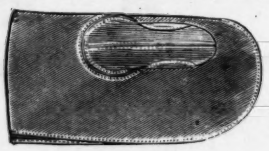

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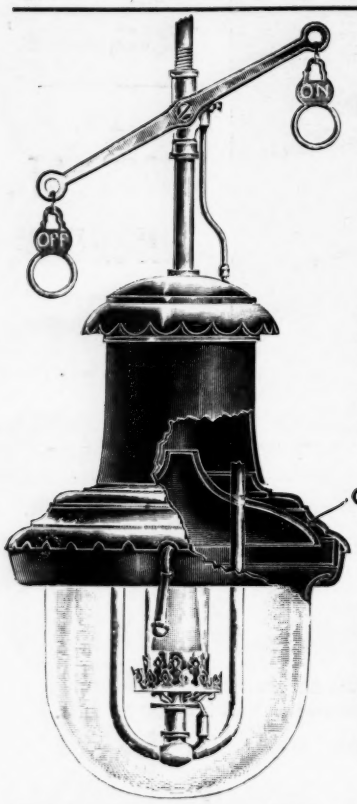

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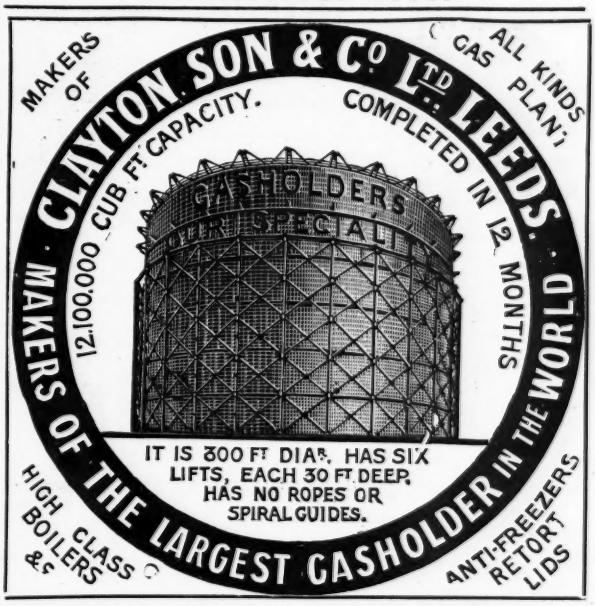
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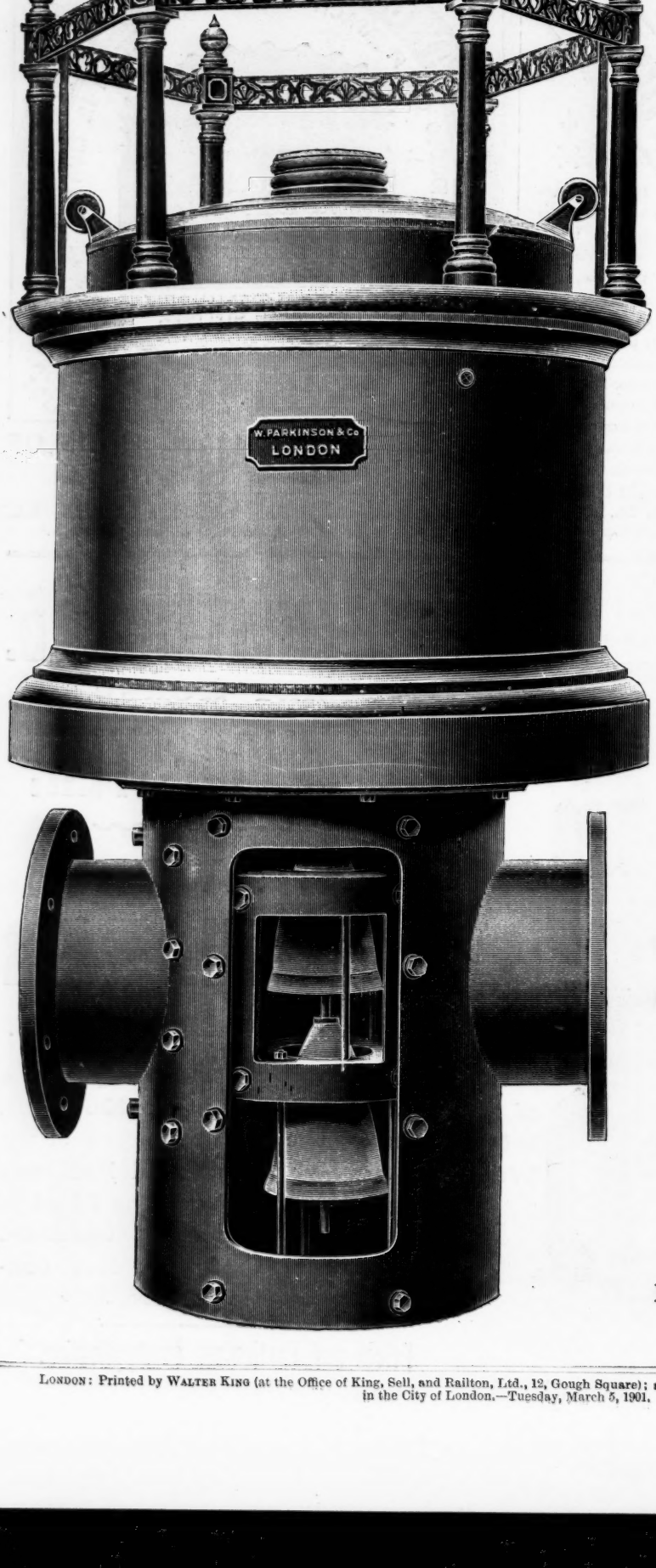

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